



the

# CORNUCOPIA

including AGFD abstracts for the

239th American Chemical Society National Meeting

March 21 - 25, 2010

in

## SAN FRANCISCO

MICHAEL APPELL, Program Chair

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visit our website: <http://membership.acs.org/a/agfd>  
deadline for submission of content for Fall 2010 Cornucopia: May 15

## MESSAGE FROM THE CHAIR

The fall ACS national meeting returned to Washington DC in 2009, which is an excellent location to foster the exchange of scientific knowledge. The Division of Agricultural and Food Chemistry (AGFD) provided an outstanding technical program with over 240 presentations in the fields of food chemistry and agricultural research. I would like to thank the symposium organizers, session chairs, presenters, and active AGFD members for their contributions to a successful program.

The 239th ACS National Meeting in San Francisco is expected to be well attended with AGFD sponsoring twelve symposia. The symposia topics represent the broad nature of our division, and include nutrigenomics, fermented foods, reactive carbonyl species, and organic foods, wine, sustainability, bioactives, nanotechnology, and biofuels and bioproducts. The increasing importance of food science and utilization of agricultural commodities has influenced ACS programming beyond our division. AGFD is a cosponsor of eight symposia planned by other technical divisions and committees that should be of interest to many of our division members.

Developing timely symposia is a critical AGFD activity and two meetings will be held in San Francisco to provide opportunities for division enthusiasts to direct AGFD programming. The Flavor and Functional Foods & Natural Products subdivisions will hold their joint meeting on Sunday, March 21 with the AGFD Future Programs meeting held on Monday. Please browse the future programs section of *the Cornucopia* or the AGFD website. Your input and suggestions for new symposia topics are highly valued. If you are unable to attend the meetings in San Francisco, please send your ideas to AGFD Chair-elect Alyson Mitchell, Vice-Chair Neil Da Costa or myself, and we will present your suggestions at the meetings.

If you are able to join us in San Francisco, please visit the AGFD hospitality table located near our technical sessions at the Moscone Center. Recent Symposium Series Books and information regarding upcoming activities will be available for browsing. Several special events are planned on Tuesday, March 23. AGFD will sponsor the 2010 Sterling B. Hendricks Memorial Lectureship award address and reception (co-sponsored by AGRO and USDA-ARS). The afternoon will include the AGFD Poster Session and Social Hour. Please join us in the evening at the AGFD Chair's Reception to congratulate the participants of the Graduate Student Symposium and honor AGFD member Glenn Fuller for his selection to the first class of ACS Fellows. This prestigious ACS society award is given to members who distinguished themselves in multiple areas, including promoting the science, the profession, and service to the American Chemical Society.

2010 is a very exciting year to be a chemist, and a member of AGFD. The papers from our recent 100th Anniversary Symposium were recently published in the *Journal of Agricultural and Food Chemistry* [*J. Agric. Food Chem.* 2009, 57 (18)]. The division is entering its 102<sup>nd</sup> year with outstanding technical programming at the spring and fall national meetings. ACS has instituted thematic programming at national meetings to highlight the multidisciplinary nature of chemistry, and AGFD has continued support of this effort by contributing three symposia under the "Chemistry for a Sustainable World" theme for the San Francisco meeting. The theme for the upcoming fall ACS meeting in Boston is "Chemistry for Preventing and Combating Disease" with active AGFD member John Finley serving as the thematic program chair. In addition, the division is preparing for the International Year of Chemistry in 2011. This special year will celebrate the achievements of chemistry, increase public appreciation of our field, and the contributions of women in science. The science behind food and agricultural practices offers extraordinary opportunities for our division to increase appreciation of chemistry in this special year.

Lastly, I would like to express my gratitude to the AGFD executive committee and the symposium organizers for their hard work and many contributions. Special thanks to our immediate past chair dk (Deepthi K. Weerasinghe), *Cornucopia* editor Carl Frey, Cynthia Mussinan, and Michael Tunick for their patience, and guidance with the program and other duties. These outstanding people have made volunteering for ACS and AGFD an enjoyable and rewarding experience.

Michael Appell  
2010 AGFD chair  
michael.appell@ars.usda.gov

### CORNUCOPIA EDITORIAL STAFF & CONTACT INFORMATION

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General Manager	P. White			
Staff	C. Kent, L. Lane, J. Olsen			

## FUTURE PROGRAMS

submit abstracts via the ACS Program & Abstract Creation System (PACS) - [www.acs.org](http://www.acs.org) click on Meetings

### **BOSTON - August 22-26, 2010**

**AGFD Division Award Symposium** - Michael Appell [michael.appell@ars.usda.gov](mailto:michael.appell@ars.usda.gov)

**Agricultural and Food Derived Natural Products for Preventing and Combating Disease** - Bhimanagouda S. Patil, Vegetable and Fruit Improvement Center, Texas A&M University [b-patil@tamu.edu](mailto:b-patil@tamu.edu) Jayaprakasha, G.K. Vegetable and Fruit Improvement Center, Texas A&M University [gkjp@tamu.edu](mailto:gkjp@tamu.edu) Navindra Seeram, Department of Biomedical and Pharmaceutical Sciences, College of Pharmacy, University of Rhode Island [nseeram@mail.uri.edu](mailto:nseeram@mail.uri.edu)

**Caffeine and Other Natural Product Stimulants** - Elvira De Mejia, Univ. of Illinois - Urbana-Champaign, Dept. of Food Science and Human Nutrition [edemejia@uiuc.edu](mailto:edemejia@uiuc.edu)

**Flavor Chemistry of Alcoholic Beverages** - Michael Qian and Thomas Shellhammer, Department of Food Science & Technology, Oregon State University [michael.qian@oregonstate.edu](mailto:michael.qian@oregonstate.edu)

**Flavor Chemistry of Sweet Brown Flavors** - Mathias Sukan, Pepsi-Cola R&D, Valhalla, NY [Mathias.Sukan@pepsi.com](mailto:Mathias.Sukan@pepsi.com)

**Flavor Workshop** - Terry Acree, Cornell Univ. [tea2@cornell.edu](mailto:tea2@cornell.edu) Jane Leland, Kraft Foods [JLeland@Kraft.com](mailto:JLeland@Kraft.com)

**Free-Radicals and Antioxidants** - Lucy Yu, University of Maryland, Department of Nutrition and Food Science [lyu5@umd.edu](mailto:lyu5@umd.edu) John Finley, Louisiana State University Agcenter [JFinley@agcenter.lsu.edu](mailto:JFinley@agcenter.lsu.edu)

**General Papers and General Posters** - Alyson Mitchell, University of California - Davis [aemitchell@ucdavis.edu](mailto:aemitchell@ucdavis.edu) Neil Da Costa, International Flavor and Fragrances [neil.dacosta@iff.com](mailto:neil.dacosta@iff.com)

**Small Wonders: Peptides for Disease Control** - Kanniah Rajasekaran, USDA-ARS-SRRC [Rajah.Rajasekaran@ars.usda.gov](mailto:Rajah.Rajasekaran@ars.usda.gov) Jeff Cary, USDA-ARS-SRRC [Jeff.Cary@ars.usda.gov](mailto:Jeff.Cary@ars.usda.gov) Jesse Jaynes, Tuskegee University [jjsqrd@bellsouth.net](mailto:jjsqrd@bellsouth.net)

**Undergraduate Research Symposium** - Charles Brine, CJ Brine and Associates [brinec11@verizon.net](mailto:brinec11@verizon.net)

**Young Scientist Award Symposium** - Charles Brine, CJ Brine and Associates [brinec11@verizon.net](mailto:brinec11@verizon.net)

<b>ACS National Meeting Theme for Fall 2010, Boston - Chemistry for Preventing &amp; Combating Disease</b>
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### **ANAHEIM - March 27-31, 2011**

**AGFD International Year of Chemistry Symposium** - Deepthi Weerasinghe Pepsi-Cola Co. [dkweerasinghe@att.net](mailto:dkweerasinghe@att.net) Michael Appell USDA-ARS-NCAUR [michael.appell@ars.usda.gov](mailto:michael.appell@ars.usda.gov) Alyson Mitchell, University of California, Davis [aemitchell@ucdavis.edu](mailto:aemitchell@ucdavis.edu)

**Cereal Grains: Chemistry, Nutrition & Health** - Joseph Awika Texas A&M University [jawika@ag.tamu.edu](mailto:jawika@ag.tamu.edu)

**Effects of Agricultural Practices on Bioactive Compounds** - Agnes Rimando USDA ARS NPURU [agnes.rimando@ars.usda.gov](mailto:agnes.rimando@ars.usda.gov) Lucy Yu University of Maryland, Dept of Nutrition and Food Science [lyu5@umd.edu](mailto:lyu5@umd.edu)

**General Papers and General Posters** - Alyson Mitchell, University of California - Davis [aemitchell@ucdavis.edu](mailto:aemitchell@ucdavis.edu)

**Graduate Student Symposium** - Charles Brine, CJ Brine and Associates [brinec11@verizon.net](mailto:brinec11@verizon.net) Agnes M. Rimando, USDA-ARS, Natural Products Utilization Research Unit; University, MS [agnes.rimando@ars.usda.gov](mailto:agnes.rimando@ars.usda.gov)

**Tolerant Crops** - David Kendra, Quaker Oats [Kendra.David@gmail.com](mailto:Kendra.David@gmail.com)

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**Tree nuts** - Fereidoon Shahidi, Memorial University of Newfoundland, Dept. of Biochemistry fshahidi@mun.ca

**Utilizing waste products** - Fereidoon Shahidi, Memorial University of Newfoundland, Department of Biochemistry fshahidi@mun.ca Alyson Mitchell, University of California, Davis aemitchell@ucdavis.edu

**Vitamins: Effectiveness of Supplements vs. Food** - Gene Lester USDA-ARS gene.lester@ars.usda.gov  
Michael Appell USDA-ARS-NCAUR michael.appell@ars.usda.gov

**ACS National Meeting Theme for Spring 2011, Anaheim** - Chemistry of Natural Resources

## **DENVER - August 28 - September 1, 2011**

**AGFD Division Award Symposium** - Alyson Mitchell, University of California, Davis aemitchell@ucdavis.edu

**AGFD International Year of Chemistry Symposium** - Deepthi Weerasinghe Pepsi-Cola Co.  
dkweerasinghe@att.net Michael Appell USDA-ARS-NCAUR michael.appell@ars.usda.gov Alyson Mitchell,  
University of California, Davis aemitchell@ucdavis.edu

**Aquaculture** - Agnes Rimando; USDA ARS NPURU agnes.rimando@ars.usda.gov

**Environmentally Derived Food and Beverage Taints** - Gavin Sacks Food Science and Technology, Cornell University, gls9@cornell.edu

**Flavonoid Nutrition and Interactions** - Fereidoon Shahidi, Memorial University of Newfoundland, Department of Biochemistry fshahidi@mun.ca

**General Papers and General Posters** - Neil Da Costa, International Flavor and Fragrances neil.dacosta@iff.com

**Measuring Flavor Dynamics** - Andy J. Taylor The University of Nottingham andy.taylor@nottingham.ac.uk

**Space Food** - Neil Da Costa International Flavor and Fragrances neil.dacosta@iff.com

**Sterling Hendricks Memorial Lecture** (*co-sponsored by AGRO & AGFD*) - Michael H. Tunick, Dairy Processing and Products Research Unit, USDA, ARS, Eastern Regional Research Center michael.tunick@ars.usda.gov; Kim Kaplan, USDA-Agricultural Research Service, Beltsville, MD kim.kaplan@ars.usda.gov Stephen O. Duke, Natural Products Utilization Research Unit, USDA-Agricultural Research Service sduke@olemiss.edu

**Tropical Fruits: Flavors, Color and Health Benefits** - Bhimu Patil, Vegetable and Fruit Improvement Center, Texas A&M University, b-patil@tamu.edu Kanjana Mahattanatawee, Department of Food Technology, Siam University, Thailand kanjana@siam.edu Coralia Osorio, Department of Chemistry, Universidad Nacional de Colombia, Colombia, cosorior@unal.edu.co; Fatima Jabalpurwala, Food Science and Human Nutrition Department Citrus Research and Education Center University of Florida, Lake Alfred, FL fatimaj@crec.ifas.ufl.edu

**Young Scientist Award Symposium** - Charles Brine, CJ Brine and Associates brinec11@verizon.net

**ACS National Meeting Theme for Fall 2011, Denver** - Chemistry of Air, Space, and Water

## **SAN DIEGO - March 25-29, 2011**

**Chocolate: Science and Technology** - Joe A. Vinson, University of Scranton, vinson@scranton.edu

**Graduate Student Symposium** - Charles Brine, CJ Brine and Associates brinec11@verizon.net

**General Papers and General Posters** - Neil Da Costa, International Flavor and Fragrances neil.dacosta@iff.com

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**Hispanic Foods** - Michael H. Tunick, , Dairy Processing and Products Research Unit, USDA, ARS, Eastern Regional Research Center michael.tunick@ars.usda.gov Elvira D. De Mejia, Univ. of Illinois - Urbana-Champaign, Dept. of Food Science and Human Nutrition, edemejia@uiuc.edu

**Metabolism and Bioavailability of Bioactives** - Alyson Mitchell, University of California, Davis aemitchell@ucdavis.edu Navindra Seeram, University of Rhode Island, nseeram@mail.uri.edu

## **PHILADELPHIA - September 9 - 13, 2012**

**AGFD Division Award Symposium** - Neil Da Costa, International Flavor and Fragrances neil.dacosta@iff.com

**General Papers and General Posters** - Neil Da Costa, International Flavor and Fragrances neil.dacosta@iff.com

**Synthesis of Natural Products: New Reagents and Reactions** - Michael Appell; USDA-ARS-NCAUR michael.appell@ars.usda.gov Richard Petroski USDA-ARS-NCAUR richard.petroski@ars.usda.gov

**Young Scientist Award Symposium** - Charles Brine, CJ Brine and Associates brinec11@verizon.net

## **Other PROGRAMS and SYMPOSIA - unscheduled or beyond 2012**

**Agronomics Chemistry of Natural Resources: local vs. organic, production cost vs. bringing it to market** - Organizer position available to enterprising individuals – please apply

**Authentication and Adulteration of Food** - Fereidoon Shahidi Memorial University of Newfoundland, Department of Biochemistry fshahidi@mun.ca

**Discovering Active Compounds** - John Finley, Louisiana State University Agcenter JFinley@agcenter.lsu.edu

**Flavor Stability: Chemical Changes in Flavor Molecules, Flavor-Food Matrix Interactions, Flavor Encapsulation** - Mathias Sucan, Pepsi-Cola R&D, 100 Stevens Ave, Valhalla NY Mathias.Sucan@pepsi.com

**Military Food and Packaging** - Organizer position available to enterprising individuals – please apply

**Nano-Biotechnology in Foods and Nutraceuticals** - Fereidoon Shahidi Memorial University of Newfoundland, Department of Biochemistry fshahidi@mun.ca

**Natural Products for Health and Pharmaceuticals and Biotech** - John Finley, Louisiana State University Agcenter JFinley@agcenter.lsu.edu

**Obesity and Diabetes** - Organizer position available – please contact John Finley JFinley@agcenter.lsu.edu

**Processing and Packaging in Space** - Organizer position available to enterprising individuals – please apply

**Taste Modulation** - Kanjana Mahattanatawee, Department of Food Technology, Siam University, Thailand kanjana@siam.edu Keith Cadwallader, University of Illinois cadwldr@illinois.edu

**Urban Agriculture** - Michael Appell, USDA-ARS michael.appell@ars.usda.gov

### **Session Break**

If you are reading this you are obviously not concentrating on the technical sessions - so why not take a break. Hop on the Powell-Hyde cable car - starts at Fisherman's Wharf - for a unique view of a unique city - Ding - Ding - Ding !

## Scenes from the Fall 2009 Meeting



Above (left to right) -  
- Vandana Totlani  
- Guillaume Desclaux  
- D. K. Weerasinghe  
- Tiny van Boekel  
- Dave Baines



Left (from left to right) -  
- Artemio Z. Tulio, Jr  
- Kanjana Mahattanatawee  
- Agnes Rimando

### Dr. Virginia H. Holsinger – In Memoriam

Dr. Virginia H. Holsinger, age 72, passed away after battling cancer for fifteen years. Virginia spent her entire career (39 years) with the USDA Agricultural Research Service (ARS), beginning in the dairy research laboratories at USDA Headquarters in Washington, DC and transferring in 1975 to the Eastern Regional Research Center outside Philadelphia. Her career began directly after graduation from the College of William and Mary in 1958. She received her Ph.D. in Food Science and Nutrition from Ohio State University in 1980. At the USDA-ARS she was closely associated with and recognized for the development of lactose-reduced milk products, whey-soy drink mixes for the Food-for-Peace program, encapsulated milk fat for dry bakery mixes, and low fat mozzarella cheese for the National School Lunch Program. In 1992, she was named the ARS Distinguished Scientist of the Year and in 2000 was one of the initial 50 inductees into the ARS Science Hall of Fame. Virginia was active in AGFD from 1970 to 1990 and won the AGFD Distinguished Service Award in 1986. Friends at AGFD extend condolences to her family.

## AGFD Executive Committee MEETING MINUTES

Sunday, August 16, 2009

Renaissance Hotel, Washington, DC

*Takes place at each ACS National Meeting*

Attendees: Terry Acree, Michael Appell, Charles Brine, Keith Cadwallader, Neil DaCosta, John Finley, Kevin Goodner, Guddadarang Jayaprakasha, Kanjana Mahattanatawee, Robert McGorin, Kotamballi N.C. Murthy, Alyson Mitchell, Michael Morello, Cynthia Mussinan, Bhimu Patil, Marshall Phillips, Michael Qian, Agnes Rimando, Sara Risch, Russell Rouseff, Gavin Sacks, Navindra Seeram, Michael Tunick, Deepthi Weerasinghe

AGFD Chair DK Weerasinghe called the meeting to order at 5:27 p.m.

The **minutes** of the previous meeting were approved with no changes.

Cynthia Mussinan gave the **Treasurer's Report**. In 2009, the amounts for guest registrations and travel have been lower, as have been industry donations. Investments have been up by \$43,600 in 2009 following a sharp decrease in 2008. The treasury has \$395,000. The Flavor Conference in Greece was attended by 16 students, who had their registrations paid by an ACS Innovative Programming Grant we were awarded. AGFD netted \$2048 from the conference and a book will be published. The Salt Lake City meeting cost the division \$12,000, which was lower than budgeted.

In the **Program Report**, Mike Appell noted that there were 10 symposia and 27 sessions in Washington, including four symposia cosponsored with other divisions. There are 11 symposia (two cosponsored) and 28 sessions scheduled for San Francisco (March 2010), with a \$21,000 budget. The division is agreeable to spending \$90 for nonmember one-day registrations. Alyson Mitchell said that 12 symposia were planned for Boston (August 2010), nine for Anaheim (March 2011), and six so far for Denver (August 2011). John Finley said that the theme for Boston will be "Chemistry for Preventing and Combating Disease," and there will be some changes in our program to reflect this. Some ideas were discussed. Mike Morello of the **Multidisciplinary Program Planning Group** said that the themes for Anaheim and Denver will be "Chemistry of Natural Resources" and "Chemistry of Air, Space, and Water," respectively. San Diego in March 2012 will have a Chemistry of Life theme. 2011 will be the International Year of Chemistry, and AGFD should have a tie-in with that. ACS is encouraging a public interaction event the day before a National Meeting that year. Some ideas from our division were discussed, including a symposium about food and health at the Washington meeting of the American Association for the Advancement of Science in February 2011.

The three goals in the **Strategic Plans** were discussed. Goal 1, developing focused and timely programs, needs a new person in charge, and Sara Risch suggested the Vice-Chair. Goal 2, improving communication, is succeeding through email blasts and the renovated website. Mike Morello moved that money should be budgeted for moving off the ACS server and establishing an independent site if the Communications Committee feels it would better serve our members. The money involved is nominal, and motion was passed. A new leader for Goal 3, expanding global impact, will be needed.

Sara Risch gave the **Councilor's Report**. The only pressing issue this time deals with timing of nominations for President-Elect. Sara is with the Committee on Committees, which make recommendations on committee positions (there are around 800 in all). The Salt Lake City meeting lost \$500,000 but registration for the Washington meeting as of Saturday was 13,280, which is more than expected.

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The San Francisco meeting is going to be large, and all three convention center halls will be used.

The **Awards** for 2009 are: Award for the Advancement of Application of Agricultural and Food Chemistry, Russ Rouseff; AGFD Fellow Award, Eunice Li-Chan and Bhimu Patil; Roy Teranishi Graduate Fellowship in Food Chemistry, Wenping Tang; Withycombe–Charalambous Award for Excellence in Graduate Research in Agricultural or Food Chemistry, Ka Wing Chen; Young Scientist Award, to be decided at this meeting (later determined to be Navindra Seeram). Charlie Brine said the Young Scientist Award symposium, the first ever, went well. ACS sponsored it with an Innovative Programming Grant. DK Weerasinghe said that a possible future sponsor is in the works.

DK Weerasinghe reported for **Cornucopia** editor Carl Frey and said there were no problems with the newsletter.

**Hospitality/Public Relations** Chair Charlie Brine has arranged the banquet for this meeting.

Mike Tunick reported for **Membership** Chair Lucy Yu and said that AGFD had 25 members celebrating their 25-year anniversaries with the division. As of December 31, 2008, we had 2748 members, including 2274 regular members and 166 student members. There were 1722 male members, 699 females, and 327 not applicable.

Bhimu Patil, the Chair of the **Nominating Committee**, reported that two people are running for the one Councilor position open for 2010-12. He received the names and biographies of three people from industry who were willing to run for Vice-Chair. (Among Chair, Chair-Elect, and Vice-Chair, AGFD always has one from industry, one from government, and one from academia.) The By-Laws state that the slate of officers, including the next Vice-Chair, is nominated by the Executive Committee and voted upon at the Fall Business Meeting. Thus, an open election is not within the rules. Bhimu appointed a Nominating Committee consisting of Chair DK Weerasinghe, Chair-Elect Mike Appell, Vice-Chair Alyson Mitchell, Secretary Mike Tunick, Treasurer Cynthia Mussinan, Councilors John Finley, Mike Morello, Marshall Phillips, and Sara Risch, Alternate Councilors Charlie Brine and Keith Cadwallader, and At-Large Executive members Terry Acree and Bob McGorin. Bhimu read the three candidates' biographies, and after discussion, the committee moved to select Neil DaCosta as Vice-Chair. The motion passed unanimously.

John Finley and Marshall Phillips gave a brief report on the **Journal**. The impact factor is still number one. Editor-in-Chief Jim Seiber was credited, as was Marshall, who is retiring at the end of the year. Cynthia Mussinan reported that **book royalties** are better than expected.

Bob McGorin reported for Victoria Finkenstadt about the **Website**. He said the site is doing well, and that Vicky is responsive to requests.

In **New Business**, DK Weerasinghe reported that Glenn Fuller has been named in the first group of ACS Fellows. Charlie Brine will apply for another Innovative Project Grant, this time for an Undergraduate Research Symposium. Open position announcements can be placed on the website, and the Communications Committee will develop standards for that. Mike Appell said that a new abstract system for the San Francisco meeting would open on August 24. Mike Morello asked for Subcommittee Meetings to be moved to the Monday of a National Meeting with the Future Programs Meeting following it.

The meeting was adjourned at 7:30 p.m.

*Submitted by Michael Tunick, AGFD Secretary*

**CITY BY THE BAY**

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68							69			70					
71							72					73			

**A prize to the first to fax  
a correct solution to:  
Carl Frey at Pepsi-Cola R&D  
914-749-3329**

**Congratulations to the  
winner of the coveted  
Fall 2009 prize -  
Jeffrey Singer  
of Lynbrook, NY.**

**ACROSS**

- 1 snare
- 5 Apple box
- 9 requests
- 13 the San Francisco treat
- 15 *Law & Order's* Jack -----
- 16 northern native
- 17 Ullman or Tyler
- 18 recent ACS mtg. site
- 19 setting for LA in winter
- 20 encourage
- 22 common element finish
- 23 visually detects
- 25 ~ 1% of air
- 26 well liked Lee
- 28 home of the Orange
- 30 type of stare
- 32 baby hooters
- 34 fluid-filled swellings
- 37 over head light
- 39 small
- 40 speak extemporaneously
- 41 see 37 down

- 42 *Tosca* or *Porgy & Bess*
- 44 60's campus radicals
- 45 milky prefix
- 47 embellishes
- 48 web-enabled trysts
- 50 home of the Trojans
- 51 -- 50
- 52 heart---- or ear----
- 54 quick approval
- 55 ----m's Razor
- 59 arrival board listing
- 60 refreshing beverage
- 63 must--- or cust---
- 64 affirm
- 65 calendar abbreviation
- 66 spending excess
- 68 left ---- or do ----
- 69 dim sum venue in a  
Western city
- 71 some layers
- 72 pawn
- 73 too

**DOWN**

- 1 LSD-laced episodes
- 2 shampoo instruction
- 3 angle option
- 4 Louvre pyramid designer
- 5 spectroscopic technique
- 6 type of solvent or bear
- 7 working the problem
- 8 swan and can opener
- 9 real
- 10 swindle
- 11 strong alkali
- 12 clothier Syms
- 14 consumed
- 15 CA park shaded by *Sequoia*
- 21 dip chips
- 24 California wine valley
- 27 big internet access provider
- 28 back end of a ship
- 29 employ in place of
- 31 San Francisco transport s
- 33 water pitcher
- 34 canvas holder

- 35 consistent but lousy  
report card
- 36 *Born Free* lioness
- 37 cookout staple (w/ 41 across)
- 38 element w/photosensitive salts
- 41 recent ACS national mtg. site
- 43 little in Tijuana
- 46 prep for AA analysis
- 47 puffin relatives
- 49 spuds
- 53 memorable time
- 54 related to light and sight
- 56 holiday song
- 57 rowing teams
- 58 ----sine Triphosphate
- 59 odd alternative
- 61 canyon sound
- 62 *That's Why The Lady --- Tramp*
- 64 NYC's Madison or Park
- 67 school group
- 68 alcohol functional group
- 70 former Soviet police: --VD

## AGFD DIVISION MEMBERSHIP APPLICATION

The Agricultural and Food Chemistry Division of the American Chemical Society is a non-profit organization dedicated to the technical advancement of all aspects of agricultural and food chemistry. The Division encourages AGFD technical advancement by -

- organizing AGFD symposia at ACS National Meetings and other venues
- providing workshops in AGFD topics
- publishing proceedings of AGFD symposia
- providing cash awards to leading grad students, post docs, and established AGFD scientists
- publishing *the Cornucopia* newsletter
- hosting social gatherings at national meetings

Join the over 2600 members of the AGFD division. At ACS National Meetings you can meet and discuss division activities at the AGFD hospitality table located near the AGFD technical session rooms. Use the membership application form (below) or join on-line at [www.acs.org](http://www.acs.org) (click on Technical Divisions and then select Join a Division).

<b>APPLICATION FOR AGFD DIVISION MEMBERSHIP (7623P)</b>	
title	
name	
1 <sup>st</sup> address line	
2 <sup>nd</sup> address line	
city	
state	
Zip code	
country	
e-mail address	
phone	
	<b>MEMBERSHIP FEE</b>
check one	(\$2.50 is added for international addresses to cover <i>Cornucopia</i> extra mailing costs)
<input type="checkbox"/>	I am an ACS member and wish to join AGFD (\$8.00 in US, \$10.50 international)
<input type="checkbox"/>	I am not an ACS member and wish to join AGFD (\$10.00 US, \$12.50 international)
<input type="checkbox"/>	I am a full time student and wish to join AGFD (\$5.00 US, \$7.50 international)
<b>Be cool JOIN AGFD</b>	Return application, with payment, to AGFD Membership Chair: Dr. Lucy Yu University of Maryland Department of Nutrition & Food Science, 3303 Marie Mount Hall College Park MD 20742

## 2010 AGFD OFFICERS & COMMITTEE MEMBERS

**Chair** - Serves 1 year. Presides over Division meetings, appoints committees and chairs Spring Meeting Program.  
Michael Appell  
USDA-ARS  
National Center for Agricultural Utilization Research  
1815 N. University St.  
Peoria IL 61604  
309-681-6249  
Michael.Appell@ars.usda.gov

**Chair-Elect** - Serves 1 year. Substitutes for the chair as needed and chairs Spring Meeting Program.  
Alyson Mitchell  
University of California  
One Shields Ave.  
Davis CA 95616-8598  
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Michael Morello (thru '11),  
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Agnes Rimando (thru '12),  
agnes.rimando@ars.usda.gov  
Sara Risch (thru '10),  
sjsrisch@sbcglobal.net

**Alternate Councilors** - Substitute for Councilors that can not attend Council meetings. Serve 3 years.  
Charles Brine (thru '12),  
brinec11@verizon.net  
Keith Cadwallader (thru '11),  
cadwldr@uiuc.edu  
Chi-Tang Ho (thru '10),  
ho@aesop.rutgers.edu  
Russ Rouseff (thru '10),  
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**At-Large Executive Committee Members** - Assist in management of Division. Serve 3 years.  
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Jane Leland (thru '11),  
jleland@kraft.com  
Robert McGorin (thru '11),  
robert.mcgorin@oregonstate.edu  
Harold Pattee (thru '10),  
Harold\_Pattee@ncsu.edu

**Awards Committee** - Solicits nominations and oversees awards process.  
Chair - Steve Nagy  
agscience@aol.com  
Student Awards - Chi-Tang Ho  
ho@aesop.rutgers.edu  
Fellow Awards - Fereidoon Shahidi  
fshahidi@mun.ca  
Awards Canvassing - Lauren Jackson  
lsj@cfhsan.fda.gov

**Finance** - Monitors the Division's finances for 1 year. Filled by Immediate Past Chair  
Deepthi Weerasinghe,  
dkweerasinghe@att.net

**Hospitality** - Organizes receptions and banquets.  
Charles Brine - brinec11@verizon.net

**Membership** - Responsible for recruitment and retention of Division members.  
Lucy Yu - lyu5@umd.edu

**Nominations** - Develops slate of officers. Serves 1 year. Filled by Immediate Past Chair.  
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**Public Relations** - Publicizes Division.  
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**Web Master** - Maintains web site.  
Victoria Finkenstadt,  
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**Flavor subdivision** - Develops symposia.  
Chair - Mathias Sucan,  
mksucan@aol.com  
Chair-Elect - Kotamballi N.C. Murthy,  
kncmurthy@neo.tamu.edu  
Vice-Chair - Kevin Goodner,  
klg@sensusflavors.com  
Secretary - Gavin Sacks,  
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**Functional Foods & Natural Products subdivision** - Develops symposia.  
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richard.petroski@ars.usda.gov  
Chair-Elect - Guddadarang Jayaprakasha,  
gjayaprakasha@ag.tamu.edu  
Vice-Chair - Navindra Seeram,  
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Secretary - Gene Lester,  
gene.lester@ars.usda.gov  
2011 Secretary - Luke Howard,  
lukeh@uark.edu

**This space reserved  
for your name.**

**Stop by the AGFD hospitality  
table and find out how you  
can get involved.**

## MUSSINAN'S MEMOIRS

### RAMBLINGS FROM THE RENAISSANCE; WASHINGTON, DC

First things first! Allow me to introduce you to Professor Severus Snape, Potions Master at Hogwarts (of course it's actually Mae at Halloween; go read *Harry Potter*).

Now on to my photo contest. We have a winner!! That's right folks. Barry Jacobs of Citrus and Allied correctly identified the mustachioed mystery man as Colin Ringleib from Pepsi. The photo was taken at the 7<sup>th</sup> International Flavor Conference in Rhodes, in 1985. Barry, of course, wins the grand prize of a genuine IFF pen and pencil set left over from an open house we had 17 years ago (and may not work) AND a hotel pen (stolen from the Presidente Intercontinental Hotel in Mexico City).



I am so pleased with the overwhelming response

(2) that I have decided to try this again. Can you identify all of the people (or any of them) in the photo below? Again, grand prize remains the same (I have a bunch of these pen and pencil sets, although the hotel pen may be different!!).

OK, now to the meeting. Attendance was really great. The Young Scientist symposium was a big hit and will be repeated. George Rizzi and I managed to get lost in the hotel and had to ride the escalator four times to figure out where we were. This was very reminiscent of the time we confused a supermarket with the airport in Greece (see ancient *Mussinán's Memoirs* for details). First thing George said was . . . "and don't write about this." Oh dear, my reputation precedes me. But, I digress

Most important was the visit by Gail Tunick, Mike Tunick (Secretary), Alyson Mitchell (Vice Chair), and yours truly (Treasurer) to the crime museum. Here we learned how to escape from prison, survive high speed car chases and shoot bad guys, or, in Alyson's case, good guys! A useful skill set for AGFD officers!!

See you in San Francisco and don't forget to enter the photo contest.



## AGFD Program, 239th ACS Nat'l Meeting, San Francisco, Mar. 21-25, 2010

### note to users

For the development of the Spring 2010 technical program the ACS adopted the Program & Abstract Creation System (PACS), replacing its established OASYS software. The adoption of new software always provides a rich opportunity for unforeseen errors and delays. The OASYS to PACS transition is no exception and has forced changes in how the AGFD technical program appears in *the Cornucopia*. ACS provided abstracts and paper numbers too late to list all abstracts in order at the end of the complete program. As an aid to the user the abstracts are numbered with the initials for the day, the session and its place in the session - (e.g. the abstract for the 3<sup>rd</sup> item in a Wednesday Morning session is numbered WM3 - with an exception for poster session abstracts that retain the unique but non-sequential number assigned by PACS). PACS was also not able to prepare the author/paper index (so it will not appear here) and could not generate the abstracts or program in the same format as OASYS (requiring extensive manual editing of the program and each abstract). The official program appearing on the ACS website on March 21 may therefore differ from the program that appears here.

AGFD Subdivisions - joint meeting	12:15 - 1:15 pm Sunday	March 21
Executive Committee meeting	5:00 - 8:00 pm Sunday	March 21
Future Programs meeting	12:15 - 1:15 pm Monday	March 22
Poster Session and Social Hour	2:00 - 4:00 pm Tuesday	March 23
AGFD Chair's Reception	6:00 - 8:00 pm Tuesday	March 23

### OTHER SYMPOSIA OF INTEREST

Contemporary Food Safety Issues: Mitigating Risks from Production to Processing (AGRO)  
 Advances in the Discovery of New Agrochemicals (AGRO)  
 Catalysis for Sustainability (CATL)  
 Food Chemistry Courses in the Liberal Arts Curriculum (CHED)  
 Chemistry of Wine (SOCED)  
 Health and Nutrition of Polysaccharides (CELL)  
 Advances in Biofuels and Bioproducts: Life Cycle Analysis and Sustainability (AGRO)  
 Sustainability of the Sugar and Sugar-Ethanol Industries (CARB)

## AGFD technical sessions take place at the Moscone Center

### SUNDAY MORNING March 21 Section A

#### Progress in Authentication of Food and Wine Overview and Analytical Methods

Gary Takeoka, Peter Winterhalter, Susan Ebeler, Organizers Gary Takeoka, Peter Winterhalter, Presiding

8:30 1. Overview: Progress in authentication of food and wine. S. E. Ebeler, G. R. Takeoka

8:50 2. Scientific approaches to traceability in the food chain. R. Wittkowski, C. Fauhl-Hassek, J. Zagon

9:15 3. NMR studies in food authentication. R. Consonni, L. R. Cagliani

9:40 4. DNA and peptides as molecular markers for assessing food authenticity. S. Sforza, T. Tedeschi, R. Corradini, G. Galaverna, A. Dossena, R. Marchelli

10:05 Intermission.

10:20 5. Using chemometrics to classify samples and detect misrepresentation. K. J. Siebert

10:45 6. Establishing natural product content with the natural radiocarbon signature. B. A. Buchholz, M. J. Sarachine, P. Zermeno

11:10 7. Authentication approach of the chemodiversity of grape and wine by FTICR-MS. R. D. Gougeon, M. Lucio, D. Peyron, D. Chassagne, H. Alexandre, A. Voilley, P. Cayot, I. Gebefügi, N. Hertkorn, P. Schmitt-Kopplin

**SM1 Overview: Progress in authentication of food and wine**,1. University of California, Department of Viticulture and Enology, Davis, CA,2. USDA-ARS-WRRC, Albany, CA, ,1. Susan E. Ebeler1 seebeler@ucdavis.edu,2. Gary R. Takeoka2, gary.takeoka@ars.usda.gov,Authentication of foods, wines, beverages, and botanicals for varietal, country (or region) of origin, and processing conditions is becoming of increasing interest to consumers and regulators both in the US and internationally due to economic and food safety concerns. Historically there has been an extensive focus on issues of adulteration and contamination, and the analysis of adulterants (e.g., melamine) in,complex food and beverage matrices remains a critical area of research. However, new analytical and statistical tools now also allow for improved,characterization of the complex chemical profiles of foods and beverages that can be used to distinguish among related products based on growing or processing conditions (e.g., to confirm wine grape growing regions or vintage year for labeling purposes). We will provide an overview of recent,progress in the methods used for food, beverage and botanical authentication as well as presenting some of the challenges facing researchers in,this area.

**SM2 Scientific approaches to traceability in the food chain**,1. Bundesinstitut fuer Risikobewertung, Berlin, Germany,1. Reiner Wittkowski1, Reiner.Wittkowski@bfr.bund.de,2. Carsten Faulh-Hassek1 ,3. Jutta Zagon1 Traceability in the food chain has become an issue of great importance. Authentication - confirmation of label declarations and descriptions or detection of fraudulent statements or ingredients by various analytical methods - is essential in precautionary consumer protection. The classical way of assessing authenticity involves determining the concentration of selected natural components which are characteristic for the food. The comparison of the data thus obtained with previously established normal concentration ranges for the substances is the particular,decisive factor of this assessment. There are a great variety of analytical techniques being applied including wet chemistry for the analysis of the main nutrients, and dedicated chromatographic and spectroscopic methods. The development of multi-isotopic/multi-component fingerprints will probably lead to a better characterization of geographical origin. In addition, DNA analytical tools to identify e.g., special breeds or the origin of plant derived foods such as honey gain more attention,

**SM3 NMR studies in food authentication**,1. National Council of Research - ISMAC, NMR Laboratory, Milan, Italy ,1. Roberto Consonni1, roberto.consonni@ismac.cnr.it,2. Laura Ruth Cagliani1 In the last years, NMR has largely showed its great potentiality in food characterization. The capability to detect several,metabolites in one single experiment, lead to increase the available information that could be used in food quality determination. Recently, NMR, studies of foods focused on geographical determination started to grow as well as adulteration assessments in the view of protection policies of both local and traditional products. In this work, different foods have been investigated by means of NMR techniques and multivariate statistical analysis with particular attention in geographical origin determination and fraud detection.

**SM4 DNA and peptides as molecular markers for assessing food authenticity**,1. University of Parma, Department of Organic and Industrial Chemistry, Parma, Italy ,1. Stefano Sforza1, stefano.sforza@unipr.it,2. Tullia Tedeschi1 ,3. Roberto Corradini1 4. Gianni Galaverna1 ,5. Arnaldo Dossena1 ,6. Rosangela Marchelli1 Recently, many foods have gained in reputation and marketing value for special sensory properties claimed to be partly due to their geographical origin or way of production. Molecular markers (DNA, proteins, peptides, secondary metabolites) can be used to objectively assess food authenticity, providing that a clear-cut correlation between the declared characteristic and the analysed molecule is demonstrated. In,this communication, examples of specific DNA detection by Peptide Nucleic Acid (PNA) probes in HPLC, microarray or microfluidics platforms will,be presented in order to determine GMO-free or allergen-free foods, or for the discrimination of the tomato varieties and olive oil cultivars by SNP,detection. In the second part, it will be shown how the LC/MS analysis of the oligopeptides in cheeses, which are generated by the proteolysis during manufacturing and ripening, can be used in order to detect frauds, determine the technology of production and assess the length of ripening

**SM6 Using chemometrics to classify samples and detect misrepresentation**,1. Cornell University, Department of Food Science & Technology, Geneva, NY, ,1. Karl J Siebert1 , kjs3@cornell.edu, When multiple measurements are made on a set of samples by wet chemical, spectral, electrophoretic or chromatographic, methods, or by combinations thereof, it is possible to use multivariate pattern recognition to establish sample classifications. These classifications, can be by the growing location, crop year, or cultivar of an agricultural commodity, or by the brand or production plant of a processed food product. Methods such as principal components analysis (PCA), linear discriminant analysis (LDA), K-nearest neighbor analysis (KNN) or SIMCA may then be used to classify samples or to detect mis-matches in any direction in a multivariate sense. Adulterated or misrepresented samples can often be identified in this way. Examples using hop essential oils, beer volatile compounds and combinations of various brewing analytical methods will be,shown. Advantages and limitations of various methods will be described.

**SM7 Establishing natural product content with the natural radiocarbon signature**,1. Lawrence Livermore National Laboratory, Center for Accelerator Mass Spectrometry, Livermore, CA 1. Bruce A. Buchholz1 , buchholz2@llnl.gov,2. Miranda J. Sarachine1 3. Paula Zermeno1 ,Radiocarbon ( $^{14}\text{C}$ ) is produced naturally at relatively constant levels in the atmosphere by cosmic ray interactions with nitrogen., Isolated carbon atoms are quickly oxidized to  $\text{CO}_2$  in the atmosphere and are incorporated into biomolecules. Anthropogenic activities caused a, spike perturbation in the  $^{14}\text{C}$  content of the atmosphere over the past 55 years, but it is now almost back to 1950 level. All living things are labeled, with  $^{14}\text{C}$  while alive and retain the isotopic signature when processed into food. Carbon from petroleum sources is devoid of  $^{14}\text{C}$  and easily, distinguished from biological sources ( $^{14}\text{C}/\text{C} = 1.2$  parts per trillion) by accelerator mass spectrometry (AMS). We will briefly explain how AMS works, and present examples of how it is used to determine natural and fossil carbon content of food. We will also describe how AMS can be used to verify, if a claimed vintage is consistent with its isotopic signature.

**SM8 Authentication approach of the chemodiversity of grape and wine by FTICR-MS**,1. Institut Universitaire de la Vigne et du Vin, Université de Bourgogne, EA EMMA, France,2. Helmholtz-Zentrum Muenchen-German Research Center for Environmental Health, Institute for Ecological Chemistry, Germany ,3. Centre Européen des Sciences du Goût, Université de Bourgogne, France,4. Institut Universitaire de la Vigne et du Vin, Université de Bourgogne, EA REVV, France,5. ENSBANA, AgrosSup Dijon, EA EMMA, France,1. Régis D Gougeon1, regis.gougeon@u-bourgogne.fr,2. Marianna Lucio2 ,3. Dominique Peyron3 ,4. David Chassagne1 ,5. Hervé Alexandre4 ,6. Andrée Voilley5 ,7. Philippe Cayot5 ,8. Istvan Gebefügi2 ,9. Norbert Hertkorn2 ,10. Philippe Schmitt-Kopplin2 ,The metabolic

composition of grapes and related wines results from a complex interplay between environmental, genetic and human factors which are not easily or possibly resolvable into their unambiguous individual contributions. Whether it is in the vineyard or in the cellar, several processes can indeed subtly modulate the characteristics of grape and wine, and these modulations often involve 'trace' amounts, and interplay of metabolites within a complex matrix. As a consequence, considering wine as a complex biological system, the whole of which being different than the sum of its parts, is likely to provide deeper understanding of specificities associated with varieties and/or geographical origins, and/or wine making practices. We will show that non-targeted analyses of grape and wine by ultra high resolution mass spectrometry can reveal snapshots of the unprecedented

## **SUNDAY MORNING March 21 Section B Graduate Student Symposium**

Charles Brine, Organizer, Presiding

8:30 8. Effect of different concentration methods on the color and anthocyanin composition of Concord juice. K. S. Alongi, M. M. Iyer, O. I. Padilla, G. L. Sacks

9:00 9. Development of methods for untargeted analysis of orange juice flavor in flavoromic research. J. Charve, G. A. Reineccius

9:30 10. Comparison of GCO dilution methods for the determination of key odorants in American rye whiskey. J. Lahne

10:00 Intermission.

10:15 11. Novel strategy for prevention of diabetic complications: Trapping of reactive dicarbonyl species by dietary polyphenols. X. Shao, C.-T. Ho, S. Sang

10:45 12. Structurally modified green tea polyphenols: Applications in food and natural health products. Y. Zhong, F. Shahidi

11:15 13. Reformulating flavours using instrumental analysis. N. Yang, R. S. T. Linforth, K. Brown, S. Walsh, A. J. Taylor

**SM1 Effect of different concentration methods on the color and anthocyanin composition of Concord juice** 1. Cornell Univ, New York State Agricultural Experiment Station, Dept of Food Science and Technology, Geneva, NY, 1. Kristin S. Alongi<sup>1</sup>, ka245@cornell.edu 2. Meera M. Iyer<sup>1</sup>, 3. Olga I. Padilla<sup>1</sup>, 4. Gavin L. Sacks<sup>1</sup> The anthocyanin composition of Concord grape juice concentrate produced by concentration before detartration ("direct-to-concentrate," DTC) was compared to juice produced via cold stabilization prior to concentration (standard concentrate, SC). Improved color intensity and stability was observed in DTC compared to SC. DTC had a greater absorbance at 520 nm (1 cm effective pathlength) than SC (80 AU vs. 51 AU,  $p < 0.01$ ). The contribution of different pigment classes was greater for DTC in all cases, including monomeric anthocyanins (57 vs. 36 AU), polymeric pigments (6.0 vs. 3.0 AU), and copigmentation (17 vs. 12 AU). The pH Differential Assay confirmed these results, indicating that DTC resulted in 60% more total anthocyanins. The two concentrates, however, had the same percentage of polymeric color (15%). Ongoing work includes evaluating color changes throughout processing and storage. Results should lend insight about the mechanisms responsible for DTC's improved color properties.

**SM2 Development of methods for untargeted analysis of orange juice flavor in flavoromic research** 1. University of Minnesota, Department of Food Science and Nutrition, St Paul, MN, 1. Joséphine Charve<sup>1</sup>, charv002@umn.edu 2. Gary A Reineccius<sup>1</sup>, Comprehensive analysis of the flavor components in foods is challenging due to their diversity in physicochemical properties and the complexity of food matrices. Several sample preparation, compound separation and detection strategies were compared for the untargeted analysis of orange juice flavor. Methods were developed using pooled orange juices for broad coverage of the compounds analyzed. To extract headspace compounds, solid phase microextraction was tested with different extraction parameters. To extract compounds from juice, solid phase extraction was evaluated under different elution wash conditions. Gas chromatography time-of-flight and liquid chromatography quadrupole time-of-flight mass spectrometry were selected for analyses and optimized for resolution. Electrospray ionization and atmospheric pressure chemical ionization were compared. The number of detected features, throughput and reproducibility of the methods were used as selection criteria. The developed methods will be applied in flavoromic research to obtain greater understanding of relationships between chemical stimuli (volatiles and non-volatiles) and flavor attributes.

**SM3 Comparison of GCO dilution methods for the determination of key odorants in American rye whiskey** 1. University of Illinois, Department of Food Science and Human Nutrition, Urbana, IL, 1. Jacob Lahne<sup>1</sup>, lahne1@illinois.edu American rye whiskey is a distilled, alcoholic beverage, manufactured and consumed in the United States since before the Revolutionary War. Its aroma profiles and potent odorants have not been reported. Aroma Extract Dilution Analysis (AEDA) is a widely-used method for identifying potent odorants in food products, but is time-consuming and susceptible to extraction bias. Distilled alcoholic beverages are essentially aroma extracts in an ethanolic matrix, making them good candidates for direct injection into a gas chromatograph without further sample preparation, an approach termed Sample Dilution Analysis (SDA). SDA may eliminate difficulties with excluding ethanol from an extract and other extraction-based biases, such as the loss of highly volatile compounds. In SDA, the compounds with the highest dilution factor in SDA were syringol, phenylethanol, whiskey lactone, and vanillin, all of which had correspondingly high factors in AEDA. However, AEDA identified some other important odorants, such as  $\alpha$ -damascenone, which were less persistent in SDA.

**SM5 Novel strategy for prevention of diabetic complications: Trapping of reactive dicarbonyl species by dietary polyphenols** 1. Rutgers University, Department of Food Science, New Brunswick, NJ, 2. North Carolina Central University, Human Nutrition Research Program, Kannapolis, NC 1. Xi Shao<sup>1,2</sup>, xishao@eden.rutgers.edu 2. Chi-Tang Ho<sup>1</sup>, 3. Shengmin Sang<sup>2</sup>, Previous studies have demonstrated that reactive dicarbonyl compounds [e.g., methylglyoxal (MGO) and glyoxal (GO)] irreversibly and progressively modified proteins over time and yielded advanced glycation end products (AGEs), which are thought to contribute to the development of diabetes mellitus and its complications. Thus, decreasing the levels of MGO and GO will be an effective approach to reduce the formation of AGEs

and the development of diabetic complications. In our approach to find non-toxic trapping agents of reactive dicarbonyl species from dietary sources, we found that several dietary flavonoids are more reactive than the pharmaceutical agent, aminoguanidine. This presentation will discuss the trapping mechanism and the structure-activity relationship of different type of flavonoids as well as simple phenols.

**SM6 Structurally modified green tea polyphenols: Applications in food and natural health products** 1. Memorial University of Newfoundland, Department of Biochemistry, St. John's, NL Canada 1. Ying Zhong<sup>1</sup>, s35yz@mun.ca 2. Fereidoon Shahidi<sup>1</sup>, Epigallocatechin gallate (EGCG), the water-soluble antioxidant polyphenol in green tea leaves, was structurally modified in order to improve its lipophilicity and hence expanding its application in the food and natural health product industries. Ester derivatives of EGCG with stearic (SA), eicosapentaenoic (EPA) and docosahexaenoic (DHA) acids were synthesized, and their antioxidant activities evaluated in model food and biological systems. The esters were more effective than EGCG in inhibiting lipid oxidation in a  $\beta$ -carotene/linoleate emulsion and in cooked pork. Ester derivatives examined exhibited protective effects against LDL-cholesterol oxidation and DNA scission, superior or similar to that of the parent EGCG molecule. These results suggest that the ester derivatives of EGCG may be used as potential lipophilic alternatives to EGCG without compromised functional and physiological properties. Moreover, incorporation of health beneficial omega-3 fatty acids (EPA and DHA) into the EGCG molecule may provide additional perspectives for their application in food and as natural health products for disease risk reduction.

**SM7 Reformulating flavours using instrumental analysis** 1. University of Nottingham, Food Sciences, Loughborough, Leics United Kingdom 2. Aromco Ltd, Nuthampstead, Herts, United Kingdom 1. Nicole Yang<sup>1</sup>, ni.yang@nottingham.ac.uk 2. Rob S.T. Linforth<sup>1</sup> 3. Keith Brown<sup>2</sup>, 4. Stuart Walsh<sup>2</sup>, 5. Andrew J. Taylor<sup>1</sup>, Professional flavourists formulate flavours using their expertise and training, followed by consumer testing, which makes formulation a long process. However, formulations give different quality flavours depending on the food matrix, requiring further reformulation. Atmospheric Pressure Chemical Ionisation - Mass Spectrometry (APCI-MS) was used to measure the in-nose aroma profile of the flavours during consumption and from comparison of the profiles, quantitative guidance helped flavourists speed the reformulation process. An experimental flavour formula and some commercial flavours were applied to two confectionery products (pectin jelly & chewy candy) and reformulations obtained, which took into account the presence of fat in the chewy candy. Results illustrated that four panellists with three replicates were sufficient for consistent in-vivo measurements. Perception was checked using sensory evaluations, including different-from control test and flavour profile, which indicated that the reformulated chewy flavour tasted was a closer match to the flavour in pectin jelly.

## **SUNDAY MORNING March 21 Section C**

### **General Papers**

Michael Appell, Organizer

Guddadarang Jayaprakasha, Victoria Finkenstadt, Presiding

8:15 Introductory Remarks.

8:20 14. N-Nitroso bile acid conjugates, gut flora, and their relationship to obesity and carcinogenicity. B. Dayal

8:45 15. Structure-activity relationship of milk protein derived ACE-inhibitory peptides. P. Daodong, Z. Bo

9:10 16. Protein engineering for polyhydroxyalkanoate production. C. T. Nomura, K. Matsumoto, S. Taguchi, Q. Wang, K. Takase

9:35 17. Compatibilizing polyvinylpyrrolidone with corn zein by melt-processing. D. J. Sessa, K. Kruger Woods, A. Mohammed

10:00 Intermission.

10:15 18. Chemical characterization of poplar during dilute acid pretreatment. Y. Pu, S. Cao, M. Studer, C. Wyman, A. J. Ragauskas

10:40 19. Effects of helical content on water vapor barrier properties of fish gelatin films. B.-S. Chiou, R. Avena-Bustillos, P. Bechtel, S. Imam, G. Glenn, W. Orts

11:05 20. Characterisation and emulsification properties of electrostatic complexes formed between gum arabic and bovine serum albumin. P. A. Williams, T. Mahendran, G. O. Phillips

11:30 21. Comparing acid and alkaline catalyses of starch acetylation. C. Hu, N. Reddy, Y. Luo, K. Yan, Y. Yang

**SM1 N-Nitroso bile acid conjugates, gut flora, and their relationship to obesity and carcinogenicity** 1. UMD-New Jersey Medical School, Newark, NJ, I. Bishambar Dayal<sup>1</sup>, dayalbi@umdnj.edu: Recently a revolutionary idea was presented by Gordon and colleagues. These two papers implicated the Firmicutes, the largest bacterial phylum that are present in the gut linking with obesity. Their work points out that gut bacteria is a very important factor which contributes to differences in body weight among individuals (calorie intake and calorie expenditure). Further evidence has pointed out that high dietary intake of fat is related experimentally to an increased incidence of chemically induced colon cancer in animals, and epidemiologically to increased colorectal neoplasia in humans. A suggested mechanism for this association has been the increased production of bile acids, known co-carcinogens in response to a diet high in fats. We and others have hypothesized that high fat diets increase the risk of colon cancer by raising the concentration of endogenously produced N-nitroso bile acid conjugates. Recently facile syntheses of N-nitrosobile acid conjugates of naturally occurring bile acids and their 3b, 7b epimeric analogs (ursodeoxycholic acid, (UDCA)), a gallstone solubilizer was achieved in our laboratory. Using an aprotic solvent chemical synthesis of amides of bile acids was carried out via microwave-induced enhancement. Subsequent studies showed that as the N-nitroso bile acid conjugates decomposed, several carcinogenic species are generated which were identified and characterized by chemical ionization mass spectroscopy (CIMS). Such electrophilic species are implicated in the alkylation of DNA which results in the tumorigenesis associated with colorectal carcinomas.

**SM2 Structure-activity relationship of milk protein derived ACE-inhibitory peptides** 1. Ningbo U., Life Science and Biotechnology, Ningbo, Zhejiang, China 2. Nanjing Normal U, Nanjing, Jiangsu, China 1. Pan Daodong<sup>1</sup>, daodongpan@163.com 2. Zhao Bo<sup>2</sup>, zhaobo@nynu.edu.cn The effect of fermentation and hydrolysis conditions on the production of angiotensin-I converting enzyme (ACE)

inhibitory peptides were studied. ACE inhibitory peptides were isolated from milk protein hydrolyzate. The molecular recognition between above bioactive peptides and angiotensin converting enzyme (ACE) were studied by quantitative structure activity relationship modelling.

**SM3 Protein engineering for polyhydroxyalkanoate production** 1. SUNY-ESF, Department of Chemistry, Syracuse, NY, 2. Hokkaido Univ, Div of Biotechnology and Macromolecular Chemistry, Sapporo, Hokkaido, Japan 3. RIKEN Institute, Polymer Chemistry Laboratory, Wako-shi, Saitama, Japan 1. Christopher T. Nomura<sup>1</sup>, ctnomura@esf.edu 2. Ken'ichiro Matsumoto<sup>2</sup>, 3. Seiichi Taguchi<sup>2</sup>, 4. Qin Wang<sup>1</sup>, 5. Kazuma Takase<sup>3</sup>, Polyhydroxyalkanoates (PHAs) are microbially produced biodegradable polyesters with a wide variety of applications and ecological benefits compared to non-biodegradable, petroleum-based plastics. Despite the ecological benefits associated with PHAs, their production costs are significantly higher than petroleum-based plastics. Our lab takes a multi-disciplinary approach utilizing microbiology, biochemistry, molecular biology, and polymer chemistry, in order to develop systems and methodologies to make these biodegradable polymers more cost-competitive with petroleum-based polymers. In this study, assessment of genes involved in the utilization of various carbon sources was performed using quantitative real-time PCR (QRT-PCR) in order to identify candidates to improve carbon uptake and metabolism in *Pseudomonas putida*. In addition, individual genes involved in PHA biosynthesis have been cloned and engineered in order to improve polymer production in recombinant organisms. The use of engineered enzymes and modified metabolic pathways for PHA production will be discussed.

**SM4 Compatibilizing polyvinylpyrrolidone with corn zein by melt-processing** 1. National Center for Agricultural Utilization Research, USDA,ARS, Plant Polymer Research, Peoria, Illinois, 1. David J. Sessa<sup>1</sup>, David.Sessa@ars.usda.gov 2. Kristen Kruger Woods<sup>1</sup>, 3. Abdellatif Mohammed<sup>1</sup>, Corn zein was melt-processed with polyvinylpyrrolidone (PVP) on a Brabender single screw extruder with a 2:1 compression ratio. Three different molecular weights of PVP: 55K, 360K, 1.3M were added at 2.5 to 20% based on dry weight of zein. The melt-processed zeins were finely ground. Thermal properties of the powders were evaluated by DSC and TGA. Mechanical properties of compression molded tensile bars were evaluated by Instron and bars were also subjected to DMA analysis. Regardless of PVP molecular weights, the samples exhibited a 10% increase in tensile strength compared to the zein control. Thermal analyses confirmed that zein and PVP form a compatible blend when melt-processed.

**SM6 Chemical characterization of poplar during dilute acid pretreatment** 1. Georgia Institute of Technology, BioEnergy Science Center, Institute of Paper Science and Technology, Atlanta, GA, 2. University of California, BioEnergy Science Center, CE-CERT, Bourns College of Engineering, Riverside, CA, 3. 1. Yunqiao Pu<sup>1</sup>, Georgia Institute of Technology, Institute of Paper Science and Technology Atlanta, GA, yunqiao.pu@ipst.gatech.edu 2. Shilin Cao<sup>1</sup> 3. Michael Studer<sup>2</sup>, 4. Charles Wyman<sup>2</sup>, 5. Arthur J Ragauskas<sup>3</sup> The recalcitrance of lignocellulosic biomass is viewed as a key bottleneck in the process of biofuel production and an obstacle to the cost-effective establishment of a cellulosic biofuel industry. Pretreatment prior to addition of hydrolytic enzymes for saccharification has been applied to overcome biomass recalcitrance. In this study, poplar was subjected to dilute acid pretreatment at varying severities. Cellulose, hemicellulose and lignin were isolated from the pretreated poplar samples. Gel permeation chromatography and one- and two-dimensional nuclear magnetic resonance techniques were utilized to identify structural elements of importance to the sugar release and recalcitrance of pretreated poplars. As pretreatment proceeds, the cellulose showed a dramatic decrease in molecular weight with a DP decrease range of 30% ~ 89% depending on the pretreatment severity. The hemicellulose in poplar was mostly removed during the pretreatment and the residual hemicellulose had a significant decreased molecular weight. After pretreatment, the crystallinity index of cellulose had no significant change and appeared not related to the sugar release performance. The lignin was observed to have a decreased  $\beta$ -O-4 linkage. The results of the structural changes and their relationship to recalcitrance were examined with a perspective to future improvements in biomass pretreatment for enhanced sugar production for biofuels.

**SM7 Effects of helical content on water vapor barrier properties of fish gelatin films** 1. US Dept of Agriculture, Bioproduct Chemistry and Engineering, Albany, CA, 2. US Dept of Agriculture, Food Products Research, Albany, CA, 3. US Dept of Agriculture, Fairbanks, AK, 1. Bor-Sen Chiou<sup>1</sup>, U.S. Department of Agriculture, Bioproduct Chemistry and Engineering, Albany, CA, bor-sen.chiou@ars.usda.gov 2. Roberto Avena-Bustillos<sup>2</sup>, 3. Peter Bechtel<sup>3</sup>, 4. Syed Imam<sup>1</sup>, 5. Greg Glenn<sup>1</sup>, 6. William Orts<sup>1</sup> Cold-water fish gelatin films containing different helical contents were made from Alaska pollock (*Theragra chalcogramma*) and Alaska pink salmon (*Oncorhynchus gorbuscha*). In addition, bovine and porcine films were produced as a comparison. The helical content in each film was controlled by varying the drying temperature. The water vapor barrier properties of each film were examined using dynamic vapor sorption and water vapor permeability measurements. Films containing higher helical content had two to three times greater water vapor permeability values than those with lower helical content. These results might be due to higher water sorption by helical structures in the films. In fact, dynamic vapor sorption results indicated samples with higher helical content contained greater equilibrium moisture levels, except at low and high humidity.

**SM8 Characterisation and emulsification properties of electrostatic complexes formed between gum arabic and bovine serum albumin** 1. Glyndwr University, Department of Science and Technology, Wrexham, Wrexham, United Kingdom 1. Peter A Williams<sup>1</sup> williamsipa@glyndwr.ac.uk 2. Tharshini Mahendran<sup>1</sup>, United Kingdom 3. Glyn O Phillips<sup>1</sup> There is considerable interest in the use of polysaccharide-protein electrostatic complexes for the stabilisation of food emulsions and foams. Complexes will form when the polysaccharide and protein have opposite charge and may be soluble or in the form of coacervates or precipitates. The driving force for the interaction is the enthalpic contribution associated with the interaction of oppositely charged groups and the increase in entropy due to the release of their counterions. It has been shown that interaction is influenced by a number of factors particularly the polysaccharide to protein ratio, the pH and the ionic strength. This paper reports on work undertaken to determine the phase behaviour of gum Arabic-BSA systems and to characterise the complexes formed using a range of techniques including dynamic light scattering, laser Doppler velocimetry and isothermal titration calorimetry. The ability of the complexes to stabilise oil-in-water emulsions will also be discussed.

**SM9 Comparing acid and alkaline catalyses of starch acetylation** 1. University of Nebraska-Lincoln, Department of Textiles, Clothing & Design, Lincoln, Nebraska, 2. Donghua University, College of Chemistry, Chemical Engineering and Biotechnology, Shanghai, China 3. U. of Nebraska-Lincoln, Department of Biological Systems Engineering, Lincoln, Nebraska, 4. U. of Nebraska-Lincoln, Nebraska Center

for Materials and Nanoscience, Lincoln, Nebraska, 1. Chunyan Hu<sup>1,2</sup>, cathu81@hotmail.com 2. Narendra Reddy<sup>1</sup>, nreddy3@unlnotes.unl.edu 3. Yan Luo<sup>2</sup> luoyan@dhu.edu.cn 4. Kelu Yan<sup>2</sup>, klyan@dhu.edu.cn 5. Yiqi Yang<sup>1,3,4</sup>, yyang2@unlnotes.unl.edu We report the advantages and disadvantages of acid and alkaline catalyses for corn starch acetylation through the comparison of the acetylation processes and physical properties of the products. The objective of this research is to further enhance the industrial competitiveness of starch acetate against other thermoplastics. Efforts have been made to modify starch via acetylation to develop biodegradable thermoplastic materials with good physicochemical and functional properties. However, based on our knowledge, there were no comparisons of the pros and cons of acid and alkaline catalyses based on acetylation efficiency and physical properties of the products. In this work, starch acetates were prepared from corn starch using acetic anhydride as the acetylating agent, and effects of the reaction conditions on reaction efficiency and properties of the products were studied. Our results demonstrate that the current method which has been broadly accepted may not be the best approach for starch acetylation.

## **SUNDAY AFTERNOON March 21 Section A**

### **Progress in Authentication of Food and Wine Wine and Alcoholic Beverages**

Gary Takeoka, Peter Winterhalter, Susan Ebeler, Organizers Peter Winterhalter, Susan Ebeler, Presiding  
1:00 22. Overview of chemical markers for varietal authentication of red wines. C. Vergara Rosales, D. von Baer, C. Mardones Peña, L. Gutiérrez Quintana

1:25 23. Flavonol profiles for grape and wine authentication. I. Hermosín-Gutiérrez, N. Castillo-Muñoz, S. Gómez-Alonso, E. García-Romero

1:50 24. Suitability of grape-derived phenolic compounds for determining wine varietal authenticity. J. A. Kennedy, R. W. Durst, J. L. Koerner, B. W. Smith, R. E. Wrolstad

2:15 25. Authentication of different terroirs of German Riesling using sensory and flavor analysis. U. Fischer, A. Bauer, S. Wolz, A. Schormann, H.-G. Schmarr

2:40 Intermission.

2:55 26. Authentication of red wine vintage using bomb-pulse <sup>14</sup>C RE Asenstorfer, GP Jones, G Laurence, U Zoppi

3:20 27. Analytical and multivariate statistical methods for differentiation of wines produced with oak chips and barriques. H. Wachter, M. Müller, N. Christoph, H. J. Köhler, P. Winterhalter

3:45 28. Influence of the storage in oak barrels on the aroma blueprint of red wine made from Dornfelder grapes. S. Frank, P. Schieberle

4:10 29. Characterization of the key aroma compounds in brandies from different origins. P. Schieberle, V. Uselmann

4:35 30. Mezcal: The other Agave drink. M. G. López

**SA1 Overview of chemical markers for varietal authentication of red wines**,1. Universidad de Concepción, Departamento de Análisis Instrumental, Concepción, Chile,2. Pontificia Universidad Católica de Chile, Departamento de Estadística, Santiago, Chile,1. Carola Vergara Rosales<sup>1</sup>, dvonbaer@udec.cl,2. Dietrich von Baer<sup>1</sup>, dvonbaer@udec.cl,3. Claudia Mardones Peña<sup>1</sup>, P,4. Luis Gutiérrez Quintana<sup>2</sup>, Wine consumer preferences may change with time. This is driven by several factors, i.e., the type of consumers, traditions, trends, marketing, origin area, opinion of wine writers. The movie "Sideways" for example, acted as driving force, increasing the demand for Pinot Noir and, diminishing that for Merlot wines. On the other hand, a global wine market needs objective tools to verify varietal authenticity, to make the international trade more transparent and the product more confident by consumers., This work provides an overview of the published literature on chemical markers, like phenolic compounds, that has been proposed to classify red wines according to their variety. Also the statistical tools employed as well as the incidence of wine processing technology and other practical aspects that can limit the applicability of the proposed alternatives will be discussed.

**SA2 Flavonol profiles for grape and wine authentication**,1. Universidad de Castilla-La Mancha, Instituto Regional de Investigación Científica Aplicada (IRICA), Ciudad Real, Spain,2. Instituto de la Vid y el Vino de Castilla-La Mancha (IVICAM), Tomelloso, Ciudad Real, Spain,1. Isidro Hermosín-Gutiérrez<sup>1</sup> isidro.hermosin@uclm.es,2. Noelia Castillo-Muñoz<sup>1</sup>,3. Sergio Gómez-Alonso<sup>2</sup>,4. Esteban García-Romero<sup>2</sup>, Flavonols are phenolic compounds located in grape skins which are produced under genetic control; therefore, they are potential chemical markers for cultivar authentication of grapes and their corresponding wines, similarly as anthocyanins have been used for red grapes and wine. However, flavonols can be used for both red and white grape cultivars and their wines. Flavonols occur in grapes as 3- glycosides, (3- glucosides, 3- galactosides, and 3- glucuronides) of the six expectable flavonoid structures in red grapes (the monosubstituted kaempferol; the, disubstituted quercetin and isorhamnetin; and the trisubstituted myricetin, laricitrin, and syringetin), while white grapes only contain mono- and, disubstituted flavonol 3- glycosides. In addition, grapes also contain traces of rutin (quercetin 3-(6"-rhamnosyl)-glucoside). Flavonol profiles (molar percentages of each individual flavonol) are characteristic enough to allow differentiation among grape cultivars. In wine, flavonol glycosides, undergo partial hydrolysis and the application of flavonol profiles for cultivar authentication needs the recalculation as aglycone-type flavonol profiles.

**SA3 Suitability of grape-derived phenolic compounds for determining wine varietal authenticity**,1. Oregon State University, Department of Food Science and Technology, Corvallis, Oregon,2. Oregon State University, Linus Pauling Institute, Corvallis, Oregon,3. Oregon State University, Department of Environmental and Molecular Toxicology, Corvallis, Oregon,4. The Australian Wine Research Institute., Glen Osmond, SA, Australia,1. James A. Kennedy<sup>1</sup>, james.kennedy@awri.com.au,2. Robert W. Durst<sup>1,2</sup>,3. Jayma L. Koerner<sup>1</sup>,4. Brian W. Smith<sup>3</sup>,5. Ronald E. Wrolstad<sup>1</sup>, The varietal integrity of wines is important from an authenticity and regulatory standpoint, and considerable effort is being directed towards the development of accurate methods for making this determination. Methods relying upon grape-based phenolic compounds have been developed, and the anthocyanin and flavonol flavonoids are most commonly utilized. For anthocyanins, quantitative variations in hydroxylation, esterification, and the values based upon these variations, have been proposed to be

varietally specific. There is increasing evidence however that, suggests that these values vary with grape and wine production practice. Studies were conducted on Cabernet Sauvignon, Merlot, Pinot noir, Syrah, and Zinfandel, representing 67% of the total winegrape production in California, to improve our understanding of the robustness of this, analytical approach. The anthocyanins in these wines were measured and their variation with respect to wine age and blending, were determined., These results in combination with our understanding of the effect of grape and wine production practices on anthocyanin distribution and stability, suggests that grape-based phenolics may not be ideally suited for determining red wine varietal authenticity.,

**SA4 Authentication of different terroirs of German Riesling using sensory and flavor analysis**,1. DLR Rheinpfalz, Departement of Viticulture and Oenology, Neustadt/Wstr., Germany,2. UC Davis, Department of Viticulture and Enology, Davis, California, ,1. Ulrich Fischer1 ulrich.fischer@dlr.rlp.de,2. Andrea Bauer2 ,3. Sascha Wolz1 ,4. Anette Schormann1 ,5. Hans-Georg Schmarr1 ,Terroir, the combination of soil composition, micro climate and topography of vineyard site's in interaction with a specific vine, variety serves as an unique selling proposition for wine producers and simultaneously attracts consumer's attention. From an authentication, perspective it is of particular interest to investigate how wines from different terroirs can be distinguished by objective methods. Grapes from 25, highly diverse vineyard sites in Germany, exclusively planted with Riesling, were vinified in five consecutive vintages following either a standardized, winemaking protocol or individual procedures applied by participating wine estates. This split allowed evaluating the impact of individual, winemaking. Applying discriminant analysis it was possible to differentiate the six bedrock type's regarding to their sensory properties obtained by, descriptive analysis, their composition of aroma compounds as well as organic acids. PLS calibrations were conducted for a set of vintages and validated by other vintages, not used for calibration purpose.,

**SA6 Authentication of red wine vintage using bomb-pulse  $^{14}\text{C}$** ,1. University of Adelaide, School of Agriculture, Food and Wine, Adelaide, South Australia,2. University of Adelaide, School of Chemistry and Physics, Adelaide, South Australia,3. Accium BioSciences, Accelerator Mass Spectrometer Laboratory, Seattle, Washington, ,1. Robert E Asenstorfer1 ,2. Graham P Jones1, graham.jones@adelaide.edu.au,3. Gerald Laurence2 ,4. Ugo Zoppi3 ,As a result of atmospheric atomic explosions carried out in the 1940's to 1963 a potential method for the short term dating of wines, has emerged based on the determination of  $^{14}\text{C}$  in wine components. The atmospheric nuclear explosions released relatively large quantities of  $^{14}\text{C}$ , into the atmosphere which was incorporated into carbon dioxide. In the intervening period since the cessation of atmospheric tests the level of  $^{14}\text{C}$ , carbon dioxide has steadily decreased as a result of dilution by ancient carbon dioxide generated by the burning of fossil fuels. The uptake and sequestering of atmospheric  $\text{CO}_2$  by plants means that by accurately measuring the amount of residual  $^{14}\text{C}$  in plant derived-products, the year, when that sequestration took place can be determined. The amount of  $^{14}\text{C}$  in grape-derived components in the wine, such as its alcohol, has been used to reliably determine red wine vintage.,

**SA7 Analytical and multivariate statistical methods for differentiation of wines produced with oak chips and barriques**,1. Bavarian Health and Food Safety Authority, Department of Beverage Analysis, Wuerzburg, Germany,2. Bayerische Landesanstalt für Weinbau und Gartenbau, Veitshöchheim, Germany,3. Technical University Braunschweig, Institute of Food Chemistry, Braunschweig, Germany, ,1. Helmut Wachter1 ,2. Magdalena Müller1 , magdalena.mueller@lgl.bayern.de,3. Norbert Christoph1 ,4. Hans Jürgen Köhler2 ,5. Peter Winterhalter3 ,Oaked wines are increasingly produced and offered on the global wine markets. The traditional but expensive technology is the, wine ageing in oak barrels (barrique), more economical and faster is an oak chips treatment. In the European Union the use of oak chips is allowed, with exception of high quality wines and barrique labelled wines. To protect the consumer against deception, it is fundamental to establish analytical, methods to prove an oak chips treatment. At first, differentiation based on profiles of volatile compounds from toasted oak was tested. Using SPE, followed by GC-MS analysis, 28 volatiles were quantified in more than 150 reference wines produced with both techniques. In a second approach, pattern recognition with  $^1\text{H-NMR}$  data was used to find differences in the  $^1\text{H}$ -profiles of the same wines. Multivariate statistical analysis of both methods indicates a significant difference between the two production techniques and in combination, they of red wine made from Dornfelder grapes

**SA8 Influence of the storage in oak barrels on the aroma blueprint** 1. German Research Center for Food Chemistry, Garching, Germany 1. Stephanie Frank, Stephanie.Frank@lrz.tu-muenchen.de, Peter Schieberle Due to their distinct aroma profile, red wines stored in oak barrels (barrique-type) are commonly rated by the consumer to be of, higher quality. As previously shown by many studies in the area of red wine aroma, but also for spirits such as whisky, aroma compounds present in, oak wood, such as vanillin or the whisky lactone, can be considered as important modifiers of the overall aroma after aging in oak barrels. However, only a few comprehensive studies on the influence of the storage in oak barrels on the entire set of key odorants are yet available, e.g., comparing the key aroma compounds of the same wine stored in wood barrels or steel containers, respectively. In close collaboration with a wine maker in, Germany, red wines were produced from the grape variety "Dornfelder" by a traditional process. First, the key odorants in a wine stored for at least, one year in an oak barrel were characterized using the concept of molecular sensory science, i.e., aroma extract dilution analysis and quantitation, by stable isotope dilution analysis. The contribution of the odorants quantified to the overall aroma was finally confirmed by an aroma recombination, experiment using 28 compounds in their natural concentrations. A comparison of their concentrations in the same wine stored in steel vessels revealed that several odorants, such as vanillin, whisky lactone and a few further compounds were much higher in the barrel stored wine. Finally, sensory experiments were undertaken, to confirm the role of single odorants on the overall barrique-type aroma by spiking the wine stored in the steel vessels with the same amounts of odorants only occurring in the barrel aged wine. The results obtained will be discussed with as special emphasis on implications for red wine authenticity.

**SA9 Characterization of the key aroma compounds in brandies from different origins**,1. TU München, German Research Center for Food Chemistry, Germany, ,1. Peter Schieberle1 , peter.schieberle@ch.tum.de,2. Verena Uselmann1 ,Brandy is usually produced by distilling white wines fermented up to an alcohol content of about 8 percent. To modify the aroma, a, process called aging, the distillate is then stored for several months up to 20 years in oak barrels. The grape variety used, the type of oak barrels as, well as the manufacturing processes differ significantly in Spain, the main brandy producer, as well as in France or Germany. However, although the overall aroma of brandies from different origins differ significantly, data on the key aroma compounds are scarcely available. The aim of the study was, therefore, to apply the concept of molecular sensory science on commercial brandies from France, Spain and Germany., The key aroma compounds were first

located by an aroma extract dilution analysis, followed by a quantification of the most odor-active compounds. The results indicated several odorants, which clearly differed in their concentrations in the three brandies. The data obtained are a useful basis to optimize, e.g., production processes or selection of wines, but also to find indicators for the authenticity of brandies produced by different manufacturing regimes.

**SA10 Mezcal: The other Agave drink,** I. Centro de Investigación y de Estudios Avanzados, Biotechnology and Biochemistry, Irapuato, Guanajuato, Mexico, I. Mercedes G. López, [sraya@ira.cinvestav.mx](mailto:sraya@ira.cinvestav.mx), Agave angustifolia Haw. is to Agave tequilana Weber var. azul as Mezcal is to Tequila. Both Agave species are CAM, (crassulacean acid metabolism) plants, used in Mexico to elaborate the two most national spirits. In the last decade, Mezcal has gained a good popularity nationally and internationally, some probably due to the increasing and stable acceptance of its big and well known cousin, Tequila. Even though it has been documented that the elaboration of both alcoholic beverages has the same date. A global view of Mezcal will be presented, from its very rustic to the more civilized aspects of its elaboration. Opposite to Tequila which can only be done with one Agave species and restricted to 5 Mexican states, Mezcal can be elaborated with different Agave species mainly as A. angustifolia Haw., A. potatorum Zucc., A. salmiana, A. cantala, among others. As Tequila, Mezcal also contains an origin denomination in spite of the fact, that all these Agave species can be cultivated in many Mexican states along the whole country. A wide range of analyses (GC-MS, SPME, IR, and some GC-IR-MS) have been done in Mezcal, elaborated with A. angustifolia and A. potatorum, from the state of Oaxaca, which is known as the Center of Origin of all Agave alcoholic beverages, including Tequila.

## **SUNDAY AFTERNOON March 21 Section B**

### **Nutrigenomics: Food Components and Gene Interactions**

Agnes Rimando, Hyunsook Kim, Wallace Yokoyama, Organizers Agnes Rimando, Hyunsook Kim, Presiding

1:15 Introductory Remarks.

1:20 31. Physiological genomic approach to assess the anti-obesity potential of a novel weight loss supplement. D. Bagchi

1:45 32. Conjugated linoleic acid and vitamin E-modulation of gene expression: Implication for intervention in atherosclerosis. Y. K. Nakamura, O. T. Stanley

2:10 33. Molecular mechanisms mediating insulin-sensitizing effects of curcumin. S. T. Mathews, A. J. Zhang, T. Kim, J. Davis

2:35 Intermission.

2:50 34. Plasma cholesterol and changes in hepatic genes regulating cholesterol metabolism by HPMC in hamsters. W. H. Yokoyama, H. Kim, G. E. Bartley, S. A. Young, W. H. K. Anderson, S.-C. Hung, D. R. Albers, M. L. Langhorst, M. Turowski

3:15 35. Nutrigenomics of allenic carotenoids. K. Miyashita

3:40 36. Nutrigenomics in obesity prevention and treatment. D. M. Mutch

4:05 37. Nutrigenomics: Toward prevention of metabolic syndrome. C.-Q. Lai

**SA2 Physiological genomic approach to assess the anti-obesity potential of a novel weight loss supplement** 1. University of Houston College of Pharmacy, Department of Pharmacological and Pharmaceutical Sciences, Houston, TX2. InterHealth Research Center, Department of Research and Development, Benicia, CA, 1. Debasis Bagchi<sup>1,2</sup>, [dbagchi@interhealthusa.com](mailto:dbagchi@interhealthusa.com) Garcinia cambogia-derived (-)-hydroxycitric acid (HCA), commercially known as Super CitriMax (HCA-SX), has shown promise in weight management. HCA-SX demonstrated extensive safety and bioavailability in various models. In a randomized, double-blind clinical study (n=90), HCA-SX reduced body weight (BW), BMI, serum leptin, LDL, triglycerides and total cholesterol, while increasing HDL and excretion of urinary fat metabolites. HCA-SX induced appetite suppression by enhancing cortical serotonin release, acting as a serotonin receptor reuptake inhibitor (SRR1), and by inhibiting hypothalamic neuropeptide Y (NPY). Effects of low oral dose of HCA-SX were investigated on BW and abdominal fat transcriptome in rats to determine the effect on regulatory genes. In cDNA oligonucleotide microarray analysis study, HCA-SX restricted BW gain in rats by regulating genes encoding 5-HT and NPY receptors, as well as obesity genes such as PDGFs, AldB and LNC2. In the present study, we sought to investigate the effects of HCA-SX (500 µg HCA/ml, 48 hr) on subcutaneous preadipocytes collected from women (BMI>25). At the dosage studied, HCA-SX did not cause any loss of cell viability in differentiated adipocytes. High density (54676 probe sets) Affymetrix (U133 v3.0) GeneChip analyses were conducted in four experiments. HCA-SX treatment upregulated 366 genes and downregulated 348 genes (p<0.05, FDR <5%). Candidate genes in both sets (upregulated: MMP1, 3, 10, PLAT, leptin; downregulated: EVOL3, EPHX2, PEER, PLIN, PPARGC1A, LIPG) were also verified using real-time PCR. Leptin results were verified by ELISA. In functional assays, treatment of adipocytes with HCA-SX supported lipid droplet fragmentation. HCA-SX also significantly influenced leptin expression. Consistently, direct measurement showed lower triglyceride levels in HCA-SX-treated adipocytes. Overall these results from genome-wide transcriptome analyses and functional tests support the hypothesis that HCA-SX influences specific aspects of adipocyte biology which may explain its previously reported effects against weight gain and suppression of appetite to control obesity.

**SA3 Conjugated linoleic acid and vitamin E-modulation of gene expression: Implication for intervention in atherosclerosis** 1. University of Nevada, Reno, Nutrition Department, Reno, NV, 1. Yukiko K. Nakamura [ynakamur@unr.nevada.edu](mailto:ynakamur@unr.nevada.edu) 2. Omaye T. Stanley [omaye@unr.edu](mailto:omaye@unr.edu) Prospective, in vitro, and animal studies, suggest an inverse relationship between vitamin E and certain isomers of conjugated linoleic acid and the disease, atherosclerosis. Overall, clinical trials have failed to confirm such relationships plus even suggest potential adverse effects, particularly at high intakes of such compounds. Although both classes of compounds exhibit antioxidant and prooxidant properties, it has become more apparent that in part, these compounds are modulating selective antioxidant enzyme gene expression, possibly involving peroxisome proliferator-activated receptor (PPAR) gamma and nuclear factor (NF)-kappa B. Antioxidant and prooxidant properties of such compounds are concentration dependent and often are predicated by microenvironmental conditions, such as presence of other oxidants and co antioxidants and the localized redox states. Thus, we have speculated that consumption of antioxidants

from fruits and vegetable mimics optimal mixtures of such compounds for efficacy unlike single item dietary supplements, which can pose pharmacological or toxicological consequences at tissue levels beyond nature with adverse outcomes.

**SA4 Molecular mechanisms mediating insulin-sensitizing effects of curcumin** 1. Auburn University, Nutrition and Food Science, Auburn, AL, 1. Suresh T , mathest@auburn.edu 2. Albert J Zhang1 3. Teayoun Kim1 , 4. Jessica Davis1 Curcumin, the bioactive component of turmeric, has been shown to possess potent antioxidant and anti-inflammatory properties. Recently, several studies demonstrate that curcumin can lower blood glucose levels in animal models of diabetes. However, the molecular mechanisms related to the anti-diabetic effects are poorly understood. We demonstrate that curcuminoids act as activators of AMPK, increasing phosphorylation of AMPK and its downstream target acetyl-CoA carboxylase in H4IIE rat and Hep3B human hepatoma cells. Curcumin effectively suppressed dexamethasone-induced phosphoenol pyruvate carboxy kinase and glucose6-phosphatase gene expression. In addition, curcuminoids increased the transcriptional activation of the nuclear receptor PPARgamma. However, curcumin treatment did not induce differentiation of human subcutaneous preadipocytes. Consistent with PPARgamma activation, curcumin-treatment increased gene expression of adiponectin and its secretion from 3T3-L1 adipocytes and human subcutaneous preadipocytes. These results suggest that curcumin may function as an insulin sensitizer by activating AMPK, suppressing hepatic glucose production, and increasing adiponectin secretion.

**SA6 Plasma cholesterol and changes in hepatic genes regulating cholesterol metabolism by HPMC in hamsters** 1. USDA, ARS, WRRRC, Albany, CA, 2. Dow-Wolff Cellulosics, Midland, MI, 1. Wallace H. Yokoyama1 , wally.yokoyama@ars.usda.gov 2. Hyunsook Kim1 , 3. Glenn E Bartley1 , 4. Scott A Young2 , 5. W. H. Kerr Anderson2 , 6. Shao-Ching Hung2 , 7. David R Albers2 , 8. Marsha L Langhorst2 , 9. Maciej Turowski2 , The male Syrian hamster has similar lipid profile characteristics of humans. Male Syrian hamsters fed 39% fat calorie diets containing 5% soluble dietary fiber (hydroxypropyl-methylcellulose, HPMC) for four weeks had less plasma and hepatic lipid levels, and excreted more bile acids into the feces than animals on the same high fat diet containing 5% insoluble dietary fiber (microcrystalline cellulose, MCC). Soluble dietary fiber reduces plasma cholesterol and particularly LDL cholesterol by increasing expression of hepatic genes that regulate the LDL receptor (LDLR). CYP51 and CYP7A1 the genes regulating cholesterol and bile acid synthesis were up-regulated suggesting that sterol synthesis was increased to replace fecal excretion of bile acids. FXRalpha, a gene activated by bile acids and upstream of CYP7A1 was not activated. Further analysis of upstream genes indicated FXRalpha-independent pathways such as HNF-4alpha and PGC-1alpha may be involved in the regulation of CYP7A1 expression.

**SA7 Nutrigenomics of allenic carotenoids** 1. Hokkaido University, Faculty of Fisheries Sciences, Hakodate, Hokkaido, , Japan 1. Kazuo Miyashita1 kmiya@fish.hokudai.ac.jp Some might argue that the initial focus of carotenoids research on their role as antioxidants has set back progress in research into other biological activities of these compounds. A few molecular targets offer the most hope for anti-obesity and anti-diabetic, and anti-inflammatory therapeutics. These promising targets have been validated biologically (in animals) and are known to be reachable with small molecules. Carotenoids are part of this category. The nutritional functions of carotenoids depend on their chemical structures which differ depending on the length of the polyene, nature of the end group and various substituents they contain. The specific regulation of a carotenoid on a particular bio-molecule will be responsible for the characteristic physiological effect of the carotenoid. This presentation shows the nutrigenomic study on the anti-obesity and anti-diabetic effects of allenic carotenoids with special reference to its regulations on relative gene and protein expressions.

**SA8 Nutrigenomics in obesity prevention and treatment** 1. University of Guelph, Human Health & Nutritional Sciences, Guelph, Ontario, Canada 1. David M Mutch1 , dmutch@uoguelph.ca Over the past thirty years the prevalence of obesity has increased to epidemic proportions. Lifestyle interventions (e.g. diet and exercise) remain the most common recommendation for controlling obesity; however, the rate of success is wholly dependent on the individual. Nutrigenomics is poised to have a considerable impact on the prevention and treatment of obesity by recommending lifestyle modifications based on an individual's genetic information. Much of our recent understanding about the role of adipose tissue in obesity stems from modern molecular biology tools, such as the microarray. This presentation will discuss innovative research in which gene expression profiling has been used to improve our understanding of adipocyte function. Moreover, ongoing research is exploring whether gene expression in adipose tissue can be used to predict changes in weight following dietary interventions. The knowledge obtained from these studies demonstrates that nutrigenomics has taken important steps towards realising its promise to improve health.

**SA9 Nutrigenomics: Toward prevention of metabolic syndrome** 1. JM-USDA Human Nutrition Research Center on Aging at Tufts U. Boston, MA, Chao-Qiang Lai1 chaoqiang.lai@ars.usda.gov Eating healthy has been the focus of nutritional research for decades. However, there is no single diet that fits all for prevention of Metabolic Syndrome (MetS). The primary goal of nutrigenomics is to identify genetic variation that interact with dietary nutrients and distinguish subgroups that exhibit diverse responses to diets and lifestyle and possess increased risk to MetS and heart disease. This will ultimately help to identify vulnerable populations that will be benefit from personalized nutrition. Our research has identified a large number of genetic variants that displayed strong interaction with dietary nutrients, such as n-3 and n-6 PUFA. The progress in nutrigenomics will allow us to identify individuals who benefit from gene-based dietary recommendations. In addition, recent advances in biotechnology allow genome-wide association to search for variants that interact with diet and lifestyle. The overwhelming amount of genetic information and complexity of gene-by-environment pose a new challenge to nutrigenomics.

## **SUNDAY AFTERNOON March 21 Section C**

### **General Papers**

Michael Appell, Organizer Gene Lester, Michael Qian, Presiding

1:15 Introductory Remarks.

1:20 38. Citrus monoterpenes and its metabolites inhibit human prostate cancer cells. K. N. Chidambara Murthy, G. K. Jayaprakasha, B. S. Patil

1:45 39. Comparing beta-carotene, alpha-carotene, and beta-cryptoxanthin-rich foods as sources of vitamin A. B. J. Burri, T. R. Neidlinger  
 2:10 40. Original and derived CUPRAC methods of antioxidant characterization. R. Apak, M. Özyürek, B. Bektasoglu, K. Güçlü  
 2:35 41. Maple syrup constituents beyond macronutrients: Antioxidant phenolics in Canadian maple syrup. L. Li, M. MacDonnell, N. P. Seeram  
 3:00 Intermission.  
 3:20 42. Structural- and functional- analysis of tomato PLD-alpha C2 Domain. K. Tiwari, G. Paliyath  
 3:45 43. Identification of a coffee compound that effectively inhibits mechanisms of stomach acid secretion in human gastric parietal cells. M. Rubach, R. Lang, C. Weiss, E. Seebach, T. Hofmann, V. Somoza  
 4:10 44. Use of plasma flavonol glycosides as markers of human cranberry consumption. N. Vorsa, A. P. Singh, T. Wilson, S. Shah

**SA2 Citrus monoterpenes and its metabolites inhibit human prostate cancer cells** 1. Texas AMU., VFIC, Horticulture Science, College Station, Texas, 1. Kotamballi N Chidambara Murthy1 2. Guddadarangavannahally K Jayaprakasha1 , 3. Bhimangouda S Patil1 Texas AMUniversity, VFIC, College Station, b-patil@tamu. D-limonene, a major monoterpene found in citrus, represent for 40-90% of volatile components. Previous studies have demonstrated that D-limonene inhibit cancer cells (pulmonary, colon and breast) based on cell culture and animal studies. In the current study, citrus oil and metabolites such as perillic acid and limonene 1, 2-diol, were subjected proliferation inhibition and other biochemical analysis to understand the possible inhibitory effect on androgen dependent human prostate (LNCaP) cells. The citrus oil seems to inhibit LNCaP cells up to 40% after incubation for 72h at 100 µg/mL. Furthermore, specific bioactive compounds of citrus oil such as D-limonene and its metabolites, have also shown inhibition of more than 50% of cells at 72 h, suggesting the role of monoterpenes in induction of cell death. In addition, protein expression study on LNCaP cells treated with citrus oil, D-limonene and its metabolites have shown induction apoptosis. Increase in the ratio of Bax/bcl2 was clear evidence for induction of apoptosis. The above results were further confirmed through increased expression of cleaved PARP and decrease in the pro-caspase-3 content. Biological effect of these monoterpenes on expression of androgen receptor and PSA (prostate specific antigen), a key indicator of prostate cancer, will be discussed in detail. Results of the current study seems to suggest that major monoterpene of citrus oil, D-limonene, and its metabolites induce programmed cell death in human prostate cancer cells. These results are based on the work supported by the USDA-CSREES # 2009-34402-19831 "Designing Foods for Health" through the Vegetable & Fruit Improvement Center.

**SA3 Comparing beta-carotene, alpha-carotene, and beta-cryptoxanthin-rich foods as sources of vitamin A** 1. Western Human Nutrition Research Center, USDA, Davis, CA 2. U. of California, Davis, CA 1. Betty J Burri1,2 , betty.burri@ars.usda.gov 2. Terry R Neidlinger1 : Beta-carotene (BC), beta-cryptoxanthin (CX) and alpha-carotene (AC) are common carotenoids that can be converted to vitamin A (VA). Traditionally, conversion ratios for VA formation from AC- and CX-rich foods were set at ½ that of BC. However, conversion ratios would depend primarily on the bioavailability of AC, BC, and CX from the diet, and the substrate specificity of carotenoid monooxygenases. We calculated the ratios of serum concentration to dietary intakes for AC, BC, and CX in our laboratory and in studies reported in the literature, and found the ratios of AC and CX were 1.5 and 15X greater than BC, respectively. Few studies have reported monooxygenase activities for AC, BC, and CX, but these suggest conversion yields of 10-29% for AC and 10-60% for CX compared to BC. This suggests that CX-rich foods might be better than expected sources of VA.

**SA4 Original and derived CUPRAC methods of antioxidant characterization** 1. Istanbul University, Department of Chemistry, Istanbul, Avcilar, Turkey 1. Re\_at Apak1., rapak@istanbul.edu.tr2. Mustafa Özyürek1 ,3. Burcu Bekta\_o\_lu1 , 4. Kubilay Güçlü1: Antioxidants react with the CUPRAC (CUPric Reducing Antioxidant Capacity) reagent to produce the Cu(I)-neocuproine (Nc)chromophore measured spectrophotometrically. The method was applied to food extracts, human serum, and hydroxyl radical scavengers. Hydrophilic antioxidants in serum were measured after precipitation of proteins, while lipophilic were determined in dichloromethane. The probes of p-aminobenzoate, 3,5-dimethoxybenzoate, and salicylate were converted to CUPRAC-reactive hydroxylation products in a Fenton system, and their hydroxyl radical scavenging rate constants were determined by competition kinetics. The redox cycling of polyphenolics was prevented with catalase. Lipophilic and hydrophilic antioxidants could be simultaneously assayed in acetone-water as their inclusion complexes with methyl-β-cyclodextrin. The xanthine oxidase scavenging activity of polyphenolics was determined by urate measurement with CUPRAC. CUPRAC in urea buffer also responded to thiol-containing proteins in food. The CUPRAC methodology is evolving into an "antioxidant measurement package" in food and biochemistry.

**SA5 Maple syrup constituents beyond macronutrients: Antioxidant phenolics in Canadian maple syrup** 1. Bioactive Botanical Research Laboratory, Dept of Biomedical and Pharmaceutical Sciences, College of Pharmacy, U. of Rhode Island, Kingston, RI, 1. Liya Li1 , Dr. 2. Molly MacDonnell1 , 3. Navindra P. Seeram1 Maple syrup (MS) is obtained by concentrating the sap of certain maple species including the sugar maple tree (*Acer saccharum*). The vast majority of the world's supply of MS, estimated to be about 85%, is from Canada (primarily Quebec), with the remainder produced from north eastern United States (primarily New England/New York). Despite worldwide consumption and popularity of MS, little is known about its phytochemicals beyond its macronutrient content (sugars, amino acids, minerals). The current study was initiated to conduct a comprehensive phytochemical examination of Canadian MS and to evaluate the isolates for their potential biological activities. Two gallotannins, not previously reported in MS, were identified in Canadian MS as aceritannin (3,6-di-O-galloyl-1,5-anhydro-D-glucitol; ginnalin A) (1) and ginnalin C (2). Gallic acid (3), formed from hydrolysis of gallotannins, was also present in Canadian MS. The levels of compounds 1-3 in Canadian MS were 0.14, 0.40, and 0.55 mg/100 g, respectively. The antioxidant activities (IC50 values) of compounds 1-3 in the diphenylpicrylhydrazyl (DPPH) radical scavenging assay were 27.19, 74.37 and 18.44µM, respectively, which were superior to the commercial synthetic antioxidant, butylated hydroxytoluene (IC50 3845µM), and comparable to ascorbic acid (42.94µM). The presence of bioactive phytochemicals in Canadian MS is interesting and

relevant to uninformed consumers who are frequently not aware that fake maple/pancake syrup may lack these natural products present in real MS. Further work is being conducted in our laboratory to isolate and evaluate the biological activities of additional phytochemicals present in Canadian MS.

**SA7 Structural- and functional- analysis of tomato PLD-alpha C2 Domain** 1. University of Guelph, Department of Plant Agriculture, Guelph, Ontario, Canada 2. 1. Krishnaraj Tiwari<sup>1</sup> 2. Gopinadhan Paliyath<sup>2</sup>, gpaliyat@uoguelph.ca Activation and binding of phospholipase D (PLD) to cellular membranes during senescence ultimately influence the shelf life and quality of fruits, vegetables and flowers. The binding of PLD is achieved by the C2 domain that folds in 4 pairs of anti-parallel beta strands. N terminal region of a full length cDNA of PLD-alpha from tomato was cloned in pET28(b) vector and expressed in E.coli as His-tagged protein. Recombinant C2 domain showed micromolar affinity towards Ca<sup>++</sup> with a maximum of 2 high affinity binding sites. The C2 domain showed maximum affinity towards phosphatidic acid, and the binding varied based on the head groups of phospholipids. By contrast to animal systems, recombinant C2 domain showed no binding with phosphatidylcholine (PC). Phosphoinositide binding to C2 domain was reduced with increasing degree of phosphorylation. Chaotropic salt and pH titrations indicated an electrostatic rather than a hydrophobic mode of interaction between C2 domain and membrane.

**SA8 Identification of a coffee compound that effectively inhibits mechanisms of stomach acid secretion in human gastric parietal cells** 1. German Reserach Center for Food Chemistry, Garching, Germany 2. Technische Universität München, Food Chemistry and Molecular Sensory Science, Freising, Germany 1. Malte Rubach<sup>1</sup>, 2. Roman Lang<sup>2</sup>, 3. Carola Weiß<sup>1</sup>, 4. Elisabeth Seebach<sup>1</sup>, 5. Thomas Hofmann<sup>2</sup>, 6. Veronika Somoza<sup>1</sup>, U. of Vienna, Research Platform Molecular Food Science, Althanstrasse 14 (UZA II), Vienna, Vienna, mA-1090, Austria, veronika.somoza@univie.ac.at Coffee consumption sometimes is associated with symptoms of gastric irritation. To reduce putative gastric irritants, rawmcoffee beans may be treated with steam, ethyl acetate or dichloromethane. The resulting coffees are promoted as stomach friendly, although no mechanistic study has been published yet that verifies the stomach irritating potential of coffee nor isolated components thereof. Single compound analysis on gene regulation of pro-/anti-secretory receptors (histamine H<sub>2</sub>, acetylcholine M<sub>3</sub>, somatostatin 2) and the H<sup>+</sup>,K<sup>+</sup>-ATPase, signal transduction and functional parameters of gastric acid-associated proton secretion in human parietal gastric cells (HGT-1) revealed an anti-secretory effect for N-methylpyridinium, a coffee component formed upon roasting. This effect was even more pronounced when N-methylpyridinium was tested either in combination with other compounds for which pro-secretory effects were demonstrated, such as caffeine, catechols and N-alkanoly-5-hydroxytryptamides, or after addition to lyophilized coffee brews. These results suggest an anti-secretory effect of coffees containing high concentrations of N-methylpyridinium.

**SA9 Use of plasma flavonol glycosides as markers of human cranberry consumption** 1. Rutgers University, Philip E. Marucci Center for Blueberry and Cranberry Research and Extension, Plant Biology and Pathology, New Brunswick, NJ, 2. Winona State University, Department of Biology, MN, 3. Rutgers University, Plant Biology 1. Nicholi Vorsa<sup>1</sup>, vorsa@aesop.rutgers.edu 2. Ajay P Singh<sup>1</sup>, singh@aesop.rutgers.edu 3. Ted Wilson<sup>2</sup>, twilson@winona.edu 4. Sneha Shah<sup>3</sup>, shah@aesop.rutgers.edu Cranberries are a rich flavonoid antioxidant source, and consumption has been associated with numerous health benefits, including protection against urinary tract infections and cardiovascular diseases, as well as anticancer and anti-inflammatory activity. Cranberries are rich in biologically active flavonol glycosides, but little is known about their bioavailability or metabolism, owing to limitations in detection methodology especially in human biological materials. In a single cross-over trial, type 2 diabetics were administered white bread (WB, 57g, 160 Cal, 1 g fiber), raw cranberries (RC, 55g, 21 Cal, 1 g fiber), conventional sweetened dried cranberries (SDC, 40g, 138 Cal, 2.1g fiber), and an SDC formulation containing less sugar (SDC-LS, 40g, 113 Cal, 1.8g fiber + 10g polydextrose as a bulking agent). Plasma samples were collected prior to consumption and 30, 60, and 120 min post-prandially. Plasma flavonol analysis was performed with ultra performance liquid chromatography attached to tandem mass (MS-MS). In 10 of 13 subjects, the primary detected flavonols included quercetin (Q)-3-galactoside, Q-3-arabinofuranoside, Q-3-rhamnoside in nanogram/ml plasma concentrations 30, 60 and 90 minutes post-prandially and Q-3-glucuronidewas only detected at trace levels postprandially in plasma at 60 and 120 min. Flavonols were quantified using Multiple reaction monitoring (MRM mode). Highest levels were detected at 30 min with decreasing levels at 60 and 120 min, indicating rapid absorption and elimination of cranberry flavonols. In a second study, lyophilized cranberry extract (90MX powder) suspended in water (25g/240ml water) was administered to normal healthy human subjects, and urine samples collected prior to, and 15, 30, 60 min to 24hrs post-prandially. The three major cranberry flavonol glycosides were detected in both urine and plasma samples. These data suggest that flavonols would be useful biomarkers evaluation of cranberry consumption. Additional research is warranted to define ADME parameters.

## **MONDAY MORNING March 22 Section A**

### **Progress in Authentication of Food and Wine**

Gary Takeoka, Peter Winterhalter, Susan Ebeler, Organizers      **Food**  
Gary Takeoka, Susan Ebeler, Presiding

8:30 45. Authentication of caffeinated beverages. U. H. Engelhardt

8:55 46. Authentication of saffron spice (*Crocus sativus* L.). A. M. Sánchez, L. Maggi, M. Carmona, G. L. Alonso

9:20 47. Can consumers trust salmon production method labels through the use of chemical profiling?. B. W. Smith, K. A. Hobbie, K. A. Anderson

9:45 48. Quality and authenticity control of fruit-derived products. A. Schieber, C. Kurz, R. Fügel, R. Carle

10:10 Intermission.

10:25 49. Authentication of fruit juices by spectroscopic techniques. M. M. Giusti, L. E. Rodriguez-Saona, J. He, C. Sweeney

10:50 50. Authentication of fruit juices derived from *Morinda citrifolia* (noni). S. Tolle, V. Lander, P. Winterhalter

11:15 51. Authentication of fruit-juice aroma: Evaluating re-aromatization. C. Wolter, A. Gessler, P. Winterhalter

11:40 52. Phenolic compounds as markers for the authentication of sherry vinegars: A foresight for high quality vinegars' characterization. . M. C. Garcia-Parrilla, A. B. Cerezo, W. Tesfaye, A. M. Troncoso

**MM1 Authentication of caffeinated beverages** ,1. TU Braunschweig, Department of Food Chemistry, Braunschweig, Niedersachsen, Germany,1. Ulrich H Engelhardt1 u.engelhardt@tu-bs.de,Aspects of the authentication of the two most important caffeinated beverages, coffee and tea, will be discussed. In regards to tea,the detection of the geographic origin, the differentiation of the type of tea (green, black, white and others) and the detection of the amount of tea in,RTD beverages are the most important issues. Progress has been made by an international data collection regarding the differentiation of green,and black teas using ISO 14502-1 and -2. Other possibilities, e.g., determination of theaflavins and related compound like theaflagalins are,discussed. Compositional data of white teas and possible concepts for an authentication will be shown. In case of coffee one important issue is the,differentiation between the Arabica and Robusta variety, which is usually ,carried out by HPLC determination of 16-O-methylcafestol which is believed to,be present in Robusta only. Another issue is to detect geographic origin which,might be possible via the chlorogenic acid pattern (in green coffee). For both types of beverages other possible authentication concepts such as ,NIRS, PCR-techniques and (stable) isotope analysis, among others, are also presented.

**MM2 Authentication of saffron spice (Crocus sativus L.)**,1. Universidad de Castilla-La Mancha, ETSI Agrónomos, Departamento de Ciencia y Tecnología Agroforestal y Genética, Cátedra de Química,Agrícola, Albacete, Spain,1. Ana M Sánchez1, AnaMaria.Sanchez@uclm.es,2. Luana Maggi1 , Luana.Maggi@uclm.es,3. Manuel Carmona1 , Manuel.Carmona@uclm.es,4. Gonzalo L Alonso1 , Gonzalo.Alonso@uclm.es,Saffron spice is highly valued both in cookery and in the food industry due to its coloring properties, alluring aroma and pleasant,bitter taste. It is also highly appreciated in the cosmetics and pharmaceutical industry for its biological and medicinal virtues. The authenticity of saffron is an important matter in view of consumer protection, quality assurance, active properties and economic impact. This spice was and still,remains the most expensive in the world. Consequently, saffron has undergone a wide range of adulterations and authentication is a permanent,challenge. This chapter commences with a revision of the main characteristics of genuine saffron and goes on to deal with the history of saffron,adulteration and the most known fraudulent practices; the methods used for the assessment of authenticity and detection of adulterants; the international standards and legislation used to certify saffron. Finally, the perspectives concerning the authentication of this product are discussed.

**MM3 Can consumers trust salmon production method labels through the use of chemical profiling?**,1. Oregon State University, Department of Environmental &Molecular Toxicology, Corvallis, Oregon,1. Brian W Smith1 , bsmith@science.oregonstate.edu,2. Kevin A Hobbie1 , kevin.hobbie@oregonstate.edu,3. Kim A Anderson1 , kim.anderson@oregonstate.edu,Fish are one of the commodities covered under the United States Department of Agriculture (USDA) country of origin labeling(COOL) program, requiring labels for method of production, wild or farm-raised. Although USDA intends to use supply chain audits to ensure,compliance with the rule, scientific techniques can further support and verify the label. We measured the stable isotopes of carbon and nitrogen,and a suite of minerals/elements in over 140 salmon. The results of linear discriminate function, quadratic discriminant function, neural network,probabilistic neural network, and neural network bagging modeling methods were investigated. Five modeling approaches were used and four methods of testing each were employed to evaluate each model including re-substitution and cross-validation. Depending on model and testing scenario 85-100% accuracy was possible. Using trace elements and stable isotope ratios with modeling as a chemical fingerprint, chemical profiling could be a cost effective approach toward determining fish production methods.

**MM4 Quality and authenticity control of fruit-derived products**,1. University of Alberta, Department of Agricultural, Food and Nutritional Sci., Edmonton, Alberta, Canada,2. Hohenheim Univ., Inst of Food Science and Biotechnology, Stuttgart, Germany,1. Andreas Schieber1 , schieber@ualberta.ca,2. Christina Kurz2 ,3. Ralf Füge2 ,4. Reinhold Carle2 Fruit preparations, jams, purees and spreads are economically important fruit-derived products. Their fruit content and the,composition of the fruits used for their manufacture are crucial with respect to quality and authenticity. Blending with cheaper fruits or non-compliance with the labeled fruit content are adulterations which are hard to detect because of the usually complex recipes of these products. Low-molecular compounds are not reliable as authenticity markers since their contents and profile are easy to manipulate. We found that the,hemicellulose fraction of the alcohol-insoluble residue isolated from fruit products constitutes a process-stable marker for the determination of the fruit content. Furthermore, the neutral sugar profile obtained after hydrolysis of the hemicellulose fraction proved to be fruit specific and may therefore be used as a marker for the detection of fraudulent admixture of non-declared fruits or bulk material based on high-molecular compounds of the plant cell wall.

**MM6 Authentication of fruit juices by spectroscopic techniques**,1. The Ohio State University, Food Science and Technology, Columbus, Ohio, ,1. M Monica Giusti1 , giusti.6@osu.edu,2. Luis E Rodriguez-Saona1 ,3. Jian He1 ,4. Christian Sweeney1 ,The fruit juice industry is one of the fastest growing sectors of the beverage industry. Rapid, reliable, easy-to-use and,cost-effective techniques are needed to monitor fruit juice quality and authenticity.,Commercial fruits juices, including cranberry, Concord grape, blueberry, apple and white grape juices and cocktails were evaluated directly or after,a simple fractionation of their hydrophilic (sugar and simple acids) and non-polar (phenolic) fractions. Infrared spectra (IR) were recorded using aFourier Transform IR spectrometer equipped with attenuated total reflection (ATR) accessory and analyzed using multivariate analyses techniques. IR spectra of phenolics fractions effectively discriminated juices based on commodities, varieties and even geographic origin. A regression analysis of the IR responses generated a model capable of predicting the concentration of a high value ingredient in a juice blend.,This technique will allow for efficient monitoring of the quality and authenticity of juices and wines to protect producers, processors and consumers.

**MM7 Authentication of fruit juices derived from Morinda citrifolia (noni)**,1. TU Braunschweig, Institute of Food Chemistry, Braunschweig, Germany,2. Bavarian Health and Food Safety Authority, Oberschleissheim, Bavaria, Germany,1. Sebastian Tolle1, s.tolle@tu-bs.de,2. Vera Lander2 ,3. Peter Winterhalter1 ,The consumption of fruit juices derived from M. citrifolia (noni) has increased tremendously in the last few years. This is due to its,marketing as a remedy for several complaints. A rapid and cost-effective detection of possible adulterations of the juices (e.g., dilution with water,addition of sugar) is possible by using a NMR-based approach. For the

differentiation between fermented and non-fermented juices, however, standard analytical methods are required to ensure the quality of the product. A combination of these two methods appears to be a promising approach for the quality control of juices derived from *M. citrifolia*.

**MM8 Authentication of fruit-juice aroma: Evaluating re-aromatization**, 1. Technische Universität Braunschweig, Institute of Food Chemistry, Braunschweig, Germany, 2. Wesergold Getränkeindustrie GmbH & Co KG, Rinteln, Germany, 1. Carolin Wolter<sup>1,2</sup> carolinwolter@t-online.de, 2. Achim Gessler<sup>2</sup>, 3. Peter Winterhalter<sup>1</sup>, For restoring a fruit-juice from concentrate the extracted water and separated aroma have to be replaced in such a way that the fruit-juice from concentrate displays organoleptic and analytical characteristics at least equivalent to those of an average type of fruit-juice not from concentrate. The re-aromatization of apple-juice from concentrate can be evaluated on the basis of an aroma index. This is a complex formula, considering the contents of several aroma compounds that are typical for apple-juice aroma. When evaluating fruit-juice aroma, it must be considered that the aroma undergoes changes during production and storage. The numerous technological processes in the course of the production of apple-juice from concentrate cause several sources for losses in the aroma content; e.g., in aroma recovery, mixing and filling considerable amounts are lost. During storage the aroma content decreases drastically. The degradation of aroma occurs in all kind of packaging materials.

**MM9 Phenolic compounds as markers for the authentication of sherry vinegars: A foresight for high quality vinegars' characterization**, 1. Univ. of Sevilla, Nutrition and Food Science, Sevilla, Spain, 1. M<sup>a</sup> Carmen Garcia-Parrilla<sup>1</sup> mcparilla@us.es, 2. Ana B Cerezo<sup>1</sup>, acerezo@us.es, 3. Wendu Tesfaye<sup>1</sup>, Politechnice Univ. Madrid, food Technology, Escuela Técnica Superior de Ingenieros Agrónomos, Madrid, Spain, wendu.tesfaye@upm.es, 4. Ana M Troncoso<sup>1</sup>, Sherry vinegars are appreciated products reaching in the market higher prices than Sherry wine. Actually, the Protection of Designations of Origin is recognized since 1995. Their elaboration encompasses the acetification process to reach the required acetic degree and, aging in wood. Phenolic compounds proved valid markers to differentiate vinegars according to their origin and elaboration process. Multivariate analysis of phenolic composition data including Linear Discriminant Analysis (LDA) and Artificial Neural Networks trained by Backpropagation (BPANN) classifies correctly vinegar according to the acetification process (LDA=92.5, BPANN=99.6) and origin (LDA=88, BPANN=96.5). Good recalling classification rates were also obtained for aging periods. Indeed, phenolic aldehydes as syringaldehyde, vanillin, coniferaldehyde increase in concentration during aging. New trends in Sherry vinegars elaboration intends to shorten the production time. This is achieved by obtaining the acetic degree with submerged culture or by accelerating aging with chips. This communication presents the impact of both strategies on phenolic profile. Nowadays certain innovations to produce high quality vinegars include the type of wood used. Compounds released from it as (+)-taxifolin, in the case of cherry wood or (+)-dihydrorobinetin for acacia wood are suitable chemical markers to characterize vinegars aged in these woods.

## **MONDAY MORNING March 22 Section B**

### **Nutrigenomics: Food Components and Gene Interactions**

Agnes Rimando, Hyunsook Kim, Wallace Yokoyama, Organizers Agnes Rimando, Wallace Yokoyama, Presiding  
8:30 Introductory Remarks.

8:35 53. Nutrigenomics in cancer prevention: Bountiful harvest of putative pathways and cognate dietary mediators. F. A. Simmen, R. Xiao, Y. Su, R. C. M. Simmen

9:00 54. Molecular studies on cancer preventive phytochemicals: An example of nutrigenomics approaches. T. T. Y. Wang

9:25 55. Effects of sulforaphane on normal human prostate cells: Mechanisms of cancer prevention. D. W. Lin, A. R. Kristal, P. S. Nelson, B. S. Knudsen

9:50 Intermission.

10:05 56. Cytochrome P450 (CYP)1b1 in fetal tissue and transplacental lymphoma mortality by polycyclic aromatic hydrocarbons: Chemoprevention through maternal diet. D. E. Williams, D. J. Castro, W. M. Baird, C. Pereira, C. V. Lohr, Z. Yu

10:30 57. Cabbage juices and their components affect the expression and activity of cytochrome P450 and Nrf2 in breast cell lines. W. Baer-Dubowska, B. Licznerska, H. Szaefer, V. Krajka-Kuzniak

10:55 58. Inhibition of mammary tumorigenesis and regulation of gene interactions by dietary mixed tocopherols. N. Suh, A. K. Smolarek, H. J. Lee, J.-Y. So, P. E. Thomas, K. Reuhl, M.-J. Lee, C. S. Yang

11:20 59. Walnuts reduce prostate tumor size and growth in a mouse model of prostate cancer. P. A. Davis, V. Vasu, K. Gohil, H. Kim, W. Yokoyama, I. Khan, C. Cross

**MM2 Nutrigenomics in cancer prevention: Bountiful harvest of putative pathways and cognate dietary mediators** 1. University of Arkansas for Medical Sciences, Department of Physiology and Biophysics, Little Rock, AR, 2. Arkansas Children's Nutrition Center, Little Rock, AR, 1. Frank A. Simmen<sup>1</sup>, simmenfranka@uams.edu 2. Rijin Xiao<sup>1</sup>, 3. Ying Su<sup>1</sup>, 4. Rosalia C.M. Simmen<sup>1,2</sup>, Neoplasms are extremely heterogeneous with respect to cellular constitution and genomic integrity, making therapeutic strategies difficult to standardize. Early stages of pre-neoplasia may be less dys-regulated (from the norm) and amenable to prevention (i.e., by chemo-prevention or nutritional means). Our laboratories have a long-standing interest in the use of genomics methodologies, coupled with animal models of carcinogenesis, to identify cancer-preventive food molecules and their mechanisms of action. We have focused on rat models of mammary and colon cancers and use of AIN93G diets that confer greater (dietary protein: casein) or reduced (dietary protein: soy protein or whey protein) tumor incidence in both tissues after administration of respective carcinogen. We have also examined soy isoflavone (genistein), Shiitake mushroom, and dried blueberry in these same models. This presentation will summarize our recent results that reveal new physiological connections of food components, genes and signaling pathways in cancer prevention.

**MM3 Molecular studies on cancer preventive phytochemicals: An example of nutrigenomics approaches** 1. USDA, Diet, Genomics and Immunology Laboratory, BHNRC, Beltsville, MD, 1. Thomas T.Y. Wang1, tom.wang@ars.usda.gov The emphasis of nutrition research has evolved from prevention of deficiencies to prevention of chronic diseases such as cancer. The tools to study these interactions have also evolved and now include use of molecular genomic technologies coined by the name nutrigenomics. Population studies support an important role for diet in prevention of cancer, however several major questions remain to be elucidated including the identification of active components in the diet, the molecular targets in cells, and the mechanisms of action. Cell culture models and the use of global gene expression techniques have provided useful tools to begin to address these questions, to gain an understanding of diet-gene interactions, and to elucidate potential interaction of diet-derived compounds with cellular targets and signaling pathways within cells. Here, we present mechanistic studies describing the action of cancer preventive phytochemicals using DNA microarray as an example of studies directed at nutrigenomics. Our studies revealed the interaction of specific phytochemicals, used at physiological relevant concentrations, with hormones and cytokines-mediated pathways as potential mechanisms of action for their cancer protective effects.

**MM4 Effects of sulforaphane on normal human prostate cells: Mechanisms of cancer prevention** 1. University of Washington, Department of Urology, Seattle, WA, 1. Daniel W. Lin1 dlin@u.washington.edu 2. Alan R. Kristal1, 3. Peter S. Nelson1, 4. Beatrice S. Knudsen1, Body: Several large epidemiological studies report that regular consumption of the Brassica oleracea (Cruciferae) vegetable family is associated with reduced prostate cancer risk. In vitro and animal studies show that isothiocyanates in Brassica vegetables induce phase II detoxification enzymes, decrease cellular proliferation, and modulate oxidative stress. We examined the effects of sulforaphane (SFN), the primary and most potent isothiocyanate on normal human prostate epithelial and stromal cell cultures. We use an established in vitro cell culture system of normal primary prostate epithelial and stromal cells derived from human prostate tissue explants. Cells were treated for 48 hrs with 10uM SFN, with analysis of global gene expression changes, Ras/MAPK pathway activity in response to oxidative stress, and the androgen axis. Gene expression changes were assessed either with quantitative PCR or with custom-made gene expression platforms, normalized with Bioconductor analysis software. Twenty-seven genes were more highly expressed in cells treated with SFN, and 59 genes were reduced in expression. Several Gene Ontology (GO) categories of oxido-reductase activity were over-represented, confirming the presence of anti-oxidant response. Several enzymes involved in androgen synthesis and degradation were significantly differentially regulated by SFN. Treatment of primary prostate epithelial cells with H2O2 led to a rapid phosphorylation of MAPK, which was significantly attenuated by chronic SFN treatment. Pretreatment with SFN also reduced MAPK phosphorylation after stimulation with HGF. SFN induces a strong antioxidant response in normal human prostate cells, and prolonged exposure to SFN attenuates oxidative stress as evidenced by reduced H2O2-induced MAPK phosphorylation. Additionally, SFN interacted with the androgen axis, introducing an alternate explanation for the associations of cruciferous vegetable intake and reduced prostate cancer risk. These data further support human trials with specific emphasis on the molecular targets of SFN that can potentially be exploited in future prostate cancer prevention strategies.

**MM6 Cytochrome P450 (CYP)1b1 in fetal tissue and transplacental lymphoma mortality by polycyclic aromatic hydrocarbons: Chemoprevention through maternal diet** 1. Oregon State University, Corvallis, Oregon, 2. Oregon State University, Department of Environmental and Molecular Toxicology, Corvallis, Oregon, 3. Oregon State University, Department of Statistics, Corvallis, Oregon, 4. Oregon State University, College of Veterinary Medicine, Corvallis, Oregon, 5. National Cancer Institute, Bethesda, Maryland, 1. David E Williams1, david.williams@oregonstate.edu 2. David J Castro1, 3. William M Baird2, 4. Cliff Pereira3, 5. Christiane V Lohr4, 6. Zhen Yu1, The fetus and infant are at increased risk of adverse outcomes following exposure to toxic chemicals including carcinogens. Treatment of pregnant mice with dibenzo[a,l]pyrene (DBP) during late gestation results in high mortality from a T-cell lymphoma in offspring 3-6 months of age. Supplementation of maternal diet during 2nd and 3rd trimesters and nursing with indole-3-carbinol (I3C) provided chemoprotection for the offspring. Utilizing select crosses we demonstrated that a "responsive" maternal aryl hydrocarbon receptor (Ahrb-1/d allele) genotype reduced risk compared to the "non-responsive" Ahrd/d allele, but a responsive fetal genotype enhanced risk regardless of maternal genotype. The fetal or maternal Ahr genotype did not impact I3C-dependent chemoprevention. Pups with a null Cyp1b1 genotype were completely resistant to DBP-dependent transplacental lymphoma with hets showing a 50% reduction compared to wild-type siblings. These results demonstrate the requirement for Cyp1b1-dependent bioactivation of DBP in this transplacental cancer model and suggest this as a possible gene target for chemoprevention. Supported by PHS grants CA90890, ES00210 and ES016465.

**MM7 Cabbage juices and their components affect the expression and activity of cytochrome P450 and Nrf2 in breast cell lines** 1. Poznan University of Medical Sciences, Department of Pharmaceutical Biochemistry, Poznan, 60781 PL, Poland 1. Wanda Baer-Dubowska1, baerw@ump.edu.pl 2. Barbara Licznerska1, 3. Hanna Szafer1, 4. Violetta Krajka-Kuzniak1 Raw, or cooked cabbage and sauerkraut are common ingredients of Central and Eastern European diet. Epidemiological migrant studies have shown that consumption of these food items during adolescence was associated with a 72% reduced risk of breast cancer. We have investigated the effect of raw cabbage and sauerkraut juices of different origins or their active components, indole-3-carbinol, diindolylmethane and sulforaphane on cytochromes P450 and Nrf2 expressions and activities in breast cancer estrogen dependent (MCF7), estrogen independent (MDA-MB-231) and human epithelial nontumorigenic (MCF10A) cell lines. The results suggest that the cabbage juices by down-regulating CYP19 may exert chemopreventive effect at the early stages of breast cancer development while the application of their isolated active components might be more feasible in cancer progression phase. Modulation of Nrf2 expression occurring in immortalized normal breast epithelial cells by cabbage and sauerkraut components may represent additional mechanisms of their chemopreventive activity.

**MM8 Inhibition of mammary tumorigenesis and regulation of gene interactions by dietary mixed tocopherols** 1. Rutgers University, Department of Chemical Biology, Pharmacy, Piscataway, New Jersey, 2. Rutgers University, Joint Graduate Program in Toxicology, Piscataway, New Jersey, 3. The Cancer Institute of New Jersey, New Brunswick, New Jersey, 1. Nanjoo Suh1, nsuh@rci.rutgers.edu 2. Amanda K. Smolarek1,2, 3. Hong Jin Lee1, 4. Jae-Young Sol1, 5. Paul E. Thomas1,2,3, 6. Kenneth Reuhl2,3, 7. Mao-Jung Lee1, 8. Chung S. Yang1,2,3, Tocopherols are lipophilic antioxidants present in vegetable oils, such as cottonseed and soybean. The tocopherols consist of four isoforms,  $\alpha$ ,  $\beta$ ,  $\gamma$ , and  $\delta$  variants. Recently,  $\delta$ -tocopherol, the most common form of vitamin E in the diet in the United States, has shown anti-inflammatory and anti-cancer activity. We have found that dietary administration of mixed tocopherols (high in  $\delta$  and  $\gamma$  forms) suppresses mammary tumor growth and tumor multiplicity in Sprague Dawley rats treated with N-methyl-N-nitrosourea. In our

studies, mixed tocopherols increased the expression of p21, p27, caspase-3 and peroxisome proliferator activated receptor- $\alpha$  (PPAR- $\alpha$ ), and inhibited AKT and estrogen signaling in mammary tumors. In ACI rats implanted with slow release estrogen, mixed tocopherols have also shown anti-estrogenic action. Our mechanistic study demonstrated that tocopherols activate PPAR- $\alpha$  and antagonize estrogen action in two animal models of mammary tumorigenesis, suggesting that  $\alpha$ - and  $\gamma$ -tocopherols may be effective agents to inhibit breast cancer.

**MM9 Walnuts reduce prostate tumor size and growth in a mouse model of prostate cancer** 1. University of California, Davis, Nutrition, Davis, CA, 2. University of California, Davis, Internal Medicine, Davis, CA, 3. University of California, Davis, Dept. of Pathology and Laboratory Medicine, Davis, CA, 4. USDA-ARS-WRRC, Albany, CA, 1. Paul Andrew Davis<sup>1</sup>, padavis@ucdavis.edu 2. Vihās Vasu<sup>2</sup>, 3. Kishore Gohil<sup>2</sup>, 4. Hyunsook Kim<sup>4</sup>, 5. Wallace Yokoyama<sup>4</sup>, 6. Imran Khan<sup>3</sup>, 7. Carroll Cross<sup>2</sup>, Male TRAMP (Transgenic adenocarcinoma of the mouse prostate) mice (age 8 wks, n = 84; JAX) were fed ad lib either low fat (LF), high fat (HF) or high fat walnut (WD) diets for 9, 18, and 24 weeks. Prostate weights at 18 weeks were 60 and 46% lower in LF and WD vs. HF. WD plasma IGF1 was 30% lower than HF (p < 0.03). Prostate gene expression was probed using GeneChip Mouse Gene 1.0 ST Array and dChip. At 9 wks 11 genes, and at 18 wks 78 genes were differentially expressed (1.2 fold and p < 0.05) in WD versus HF. FOXO3A, tumor suppressor gene, was increased (-1.4 fold at 18 weeks). FOXO3A controls IGF-1/insulin sensitivity and StearoylCoA Desaturase-1 (-1.93 fold at 9 weeks), a gene that controls lipogenesis and tumor formation/growth. Walnut intake reduced tumor size and growth via decreased plasma levels and genes associated with growth/IGF-1 signaling.

## **MONDAY MORNING March 22 Section C**

### **Reactive Carbonyl Species and their Health Consequences**

Chi-Tang Ho, Shengmin Sang, Gow-Chin Yen, Mingfu Wang, Orgs Mingfu Wang, Shengmin Sang. Presiding  
9:00 Introductory Remarks.

9:05 60. Reactive carbonyl species and advanced glycation end-products in foods. C.-T. Ho, S. Sang, M. Wang

9:30 61. Methylglyoxal: Regulation of cell growth. S.-O. Kang

9:55 62. Dietary phenolics as inhibitors in protein glycation and glycotxin-induced inflammation and oxidative stress. G.-C. Yen, C.-H. Wu

10:20 Intermission.

10:40 63. Trapping of reactive dicarbonyl species by dietary flavonoids: Novel strategy to inhibit the formation of advanced glycation end products. S. Sang, X. Shao, C.-T. Ho

11:05 64. Cyclic DNA adducts of acrolein and 4-hydroxy-2-nonenal: The formation and possible roles in human cancer. F.-L. Chung, R. Nath, P. Yang, M.-S. Tang, M. Dyba

11:30 65. Natural polyphenols as sequestering agents of lipid peroxidation-derived acrolein and 4-hydroxy-trans-2-nonenal. Q. Zhu, Z.-P. Zheng, K.-W. Cheng, F. Chen, M. Wang

11:55 Concluding Remarks.

**MM2 Reactive carbonyl species and advanced glycation end-products in foods** 1. Rutgers University, Department of Food Science, New Brunswick, NJ, 2. North Carolina Central University, Julius L. Chambers Biomedical/Biotechnology Research Institute, Kannapolis, NC, 3. The University of Hong Kong, School of Biological Sciences, Hong Kong, China 1. Chi-Tang Ho<sup>1</sup> ho@aesop.rutgers.edu 2. Shengmin Sang<sup>2</sup>, 3. Mingfu Wang<sup>3</sup>, Reactive carbonyl species (RCS) such as glyoxal and methylglyoxal have been recently attracting much attention because of their possible clinical significance in chronic and age-related diseases. They are considered to accumulate in body fluids and tissues mainly by accelerated oxidative stress, and modify proteins, DNAs and phospholipids to form biologically active adducts such as advanced glycation end-products (AGEs). Accumulation of AGEs in long-lived proteins contributes to the age-related increase in brown color and fluorescence, poor solubility of lens crystallins, and to the gradual cross-linking and decrease in elasticity of connective tissue collagens with age. Due to the importance of Maillard reaction in the formation of RCS and AGEs, Maillard reaction during food processing should lead to high concentration of RCS and AGEs. The current knowledge on the RCS and AGEs in foods will be discussed.

**MM3 Methylglyoxal: Regulation of cell growth** 1. Seoul National University, Laboratory of Biophysics, School of Biological Sciences, Gwanak-gu, Seoul, Republic of Korea 2. Seoul National University, Institute of Microbiology, Gwanak-gu, Seoul, 1. Sa-Ouk Kang<sup>1,2</sup> kangsaou@plaza.snu.ac.kr Methylglyoxal (MG) is an endogenous toxic  $\alpha$ -ketoaldehyde produced by enzymatic or non-enzymatic elimination of phosphate from glycolytic pathway intermediates. MG modifies DNA and proteins, thereby inhibiting cell proliferation or inducing apoptosis. MG is a major glycation agent to form advanced glycation end product (AGE), which has been implicated in diabetic complications. MG detoxification is mainly accomplished by glyoxalase system consisting of glyoxalase I and II, which catalyzes the conversion of MG to lactic acid using GSH as a cofactor. In addition to glyoxalase system, it has been reported that aldose reductases take part in the MG metabolism in yeast and other microorganisms. Aldose reductase is a member of aldo-keto reductase superfamily and catalyzes the reduction of various aldehydes with NADPH. Aldose reductase (AlrA) can convert MG to acetol. In these systems, aldose reductase inhibits MG-mediated AGE formation and its null mutant shows the accumulation of MG and enhanced susceptibility to MG, indicating that aldose reductase plays a role in MG detoxification. Recently in Dictyostelium discoideum, it was reported that the null mutant of gcsA encoding  $\gamma$ -glutamylcysteine synthetase showed growth arrest and developmental defect and also MG accumulation when GSH is depleted. The accumulated MG induced strongly alrA expression and AlrA catalyzed MG reduction efficiently. Furthermore, MG treatment inhibited growth of wild-type cells, inducing G1 phase arrest.

**MM4 Dietary phenolics as inhibitors in protein glycation and glycotxin-induced inflammation and oxidative stress** 1. National Chung Hsing University, Department of Food Science and Biotechnology, Taichung, Taiwan Republic of China 1. Gow-Chin, gcyen@nchu.edu.tw 2. Chi-Hao Wu<sup>1</sup>, wch@mail.nchu.edu.tw Nonenzymatic glycation of proteins forming advanced glycation endproducts

(AGEs) is one of the major consequences of aging and a contributing factor in diabetic complications. Natural polyphenols, including flavonoids, phenolic acids, and silymarin (SM) were screened to evaluate their effects on protein glycation. The *in vivo* antiglycation properties of SM and its effects on biomarkers of oxidative stress and inflammation were examined in streptozotocin-induced diabetic rats. *In vitro* glycation assays showed that SM exerted marked inhibitory effects during the late stages of protein glycation and the subsequent crosslinking among the polyphenols tested. Dual action mechanisms, namely antioxidant and reactive carbonyl trapping activities, might contribute to its antiglycation effects. Supplementation with SM could suppress elevated oxidative stress as well as the release of nitric oxide and the proinflammatory cytokine TNF- $\alpha$  in diabetic animals. The circulating and tissue levels of AGEs were significantly decreased. Our study suggests that SM may serve as an effective anti-AGEs agent and as a modifier of signaling pathways to elicit its antioxidant and anti-inflammatory activities both *in vitro* and *in vivo*.

**MM6 Trapping of reactive dicarbonyl species by dietary flavonoids: Novel strategy to inhibit the formation of advanced glycation end products** 1. North Carolina Central University, Julius L. Chambers Biomedical/Biotechnology Research Institute, Kannapolis, NC, 2. Rutgers University, Department of Food Science, New Brunswick, NJ, 1. Shengmin Sang<sup>1</sup>, Prof., ssang@nccu.edu 2. Xi Shao<sup>1</sup>, 3. Chi-Tang Ho<sup>2</sup>, Carbonyl stress compounds such as glyoxal (GO) and methylglyoxal (MGO) have been recently attracting much attention because of their possible clinical significance in chronic and age-related diseases. They accumulate in body fluids and tissues mainly by accelerated oxidative stress, and modify proteins, DNAs and phospholipids to form biologically active adducts such as advanced glycation end products (AGEs). It has been well documented that AGEs progressively accumulate in the tissues and organs which develop chronic complications of diabetes mellitus, such as retinopathy, nephropathy, neuropathy, and also macrovascular disease atherosclerosis. Therefore, trapping of reactive dicarbonyl compounds can be a valuable strategy for inhibiting the formation of AGEs, and thus inhibiting or delaying diabetic complications. This presentation will discuss our recent finding that dietary flavonoids could efficiently inhibit the formation of AGEs through trapping reactive carbonyl compounds.

**MM7 Cyclic DNA adducts of acrolein and 4-hydroxy-2-nonenal: The formation and possible roles in human cancer** 1. Lombardi Cancer Center, Department of Oncology, Washington DC, 2. MD Anderson Cancer Center, Department of Experimental Therapeutics, Houston, Texas, 3. Department of Environmental Medicine, Tuxedo, New York, 1. Fung- Lung Chung<sup>1</sup>, flc6@georgetown.edu 2. Raghu Nath<sup>1</sup>, 3. Peiying Yang<sup>2</sup> 4. Moon-Shong Tang<sup>3</sup>, 5. Marcin Dybal, We have reported earlier the formation of cyclic 1,N2-propanodeoxyguanosine adducts from reactions with  $\alpha,\beta$ -unsaturated aldehydes, such as acrolein (Acr) and 4-hydroxy-2-nonenal (HNE). Acr and HNE are both major carbonyls generated by lipid peroxidation, the former is produced predominantly from n-3 polyunsaturated fatty acids (PUFAs), whereas the latter formed specifically from n-6 PUFAs. Acr is also a ubiquitous pollutant from environmental sources, such as cigarette smoke and auto exhaust. We were the first to show that these cyclic propano adducts as a new class of endogenous DNA lesions are present in tissues of rodents and humans. Acr and HNE can preferentially bind to the guanine sites of human p53 gene that coincide with the mutation hotspots observed in human lung and liver cancer, respectively, thus, implicating these cyclic adducts in certain human cancers. Recently, we detected 7-(1',2'-dihydroxyheptyl) substituted ethenodeoxyadenosine (DHHedA) in rodent and human tissues by an HPLC/ 32P-postlabeling assay and LC/Tandem MS. Because DHHedA is a product of 4-hydroxy-2,3-epoxy-nonanal. This finding lends support to the *in vivo* activation of HNE, perhaps other unsaturated carbonyls as well, via an epoxidation pathway. The discovery of the alky substituted etheno adducts in human tissues raises questions about their roles in carcinogenesis (supported by NCI grant CA043159)

**MM8 Natural polyphenols as sequestering agents of lipid peroxidation-derived acrolein and 4-hydroxy-trans-2-nonenal** 1. The University of Hong Kong, School of Biological Sciences, Hong Kong Special Administrative Region of China 1. Qin Zhu<sup>1</sup> qinz1981@gmail.com 2. Zong-Ping Zheng<sup>1</sup>, 3. Ka-Wing Cheng<sup>1</sup>, 4. Feng Chen<sup>1</sup>, 5. Mingfu Wang<sup>1</sup>, Exposure of lipid molecules to various free radicals could cause lipid peroxidation and give rise to a wide range of cytotoxic aldehydes. Highly electrophilic  $\alpha,\beta$ -unsaturated aldehydes acrolein (ACR) and 4-hydroxy-trans-2-nonenal (HNE) are intensively studied for their involvement in the development of some neurodegenerative diseases. In this study, some natural polyphenols including flavan-3-ols, theaflavins, cyanomaclurin and dihydrochalcones were found to be capable of trapping ACR and HNE by working as sacrificial nucleophiles in simulated physiological conditions. LC-MS/MS analysis showed that these effective polyphenols formed adducts with ACR and HNE. A major adduct formed from phloretin and ACR was purified and its structure was characterized by LC-MS and NMR spectroscopy as diACR-conjugated phloretin. The chemical nature of interactions between  $\alpha,\beta$ -unsaturated aldehydes and polyphenols was also proposed. Findings of the present study highlighted certain classes of polyphenols as promising sequestering agents of  $\alpha,\beta$ -unsaturated aldehydes to inhibit oxidative stress-associated diseases.

## **MONDAY AFTERNOON March 22 Section A**

### **Progress in Authentication of Food and Wine**

### **Botanicals and Ingredients**

Gary Takeoka, Peter Winterhalter, Susan Ebeler, Organizers Gary Takeoka and Peter Winterhalter, Presiding  
1:30 66. Herbal reference standards and the authentication of botanicals. M. Schwarz  
1:55 67. Detecting the components of botanical mixtures by single-strand conformation polymorphism analysis. A. M. Hirsch, C. Wu, K. Henry, M. R. Lum  
2:20 68. Identity and authenticity control of complex raw materials in the flavor industry. G. E. Krammer, A. Degenhardt, S. Brennecke, U. Schäfer, G. Lösing, S. Trautzsch, B. Weber  
2:45 69. Authentication of foods enriched with plant sterols/stanols and their esters. K.-H. Engel, A. Barnsteiner  
3:10 Intermission.  
3:25 70. Varietal screening of quercetin in onions (*Allium cepa* L.) and onion waste materials for authentication in food fortification. J. Lee, A. E. Mitchell

3:50 71. Multiresidue pesticide analysis of ginseng and other botanical dietary supplements. J. W. Wong, K. Zhang, D. G. Hayward, A. J. Krynitsky  
4:15 72. Evaluation of disposable pipette extraction (DPX) for the rapid determination of melamine and canuric acid in food. A. J. Krynitsky, W. E. Brewer, J. W. Wong, J. A. Roach  
4:40 Concluding Remarks.

**MA1 Herbal reference standards and the authentication of botanicals**,1. PhytoLab GmbH &Co. KG, Vestenbergsgreuth, Germany,1. Michael Schwarz1, michael.schwarz@phytolab.de,Analytical procedures applied in the authentication and quality control of botanicals (herbal drugs, herbal preparations, dietary ,supplements, herbal medicinal products) do usually require some sort of reference standard, e.g., an authentic herbal drug material, a sufficiently characterized extract or purified herbal constituent. Despite the importance of the analytical results alarmingly little attention is very often given to,the quality of the underlying reference standards. The presentation will therefore focus on the requirements for the analytical characterisation of,primary reference substances. The necessity to determine not only organic impurities but also water, residual solvents and inorganic impurities for, reliable quantitative results will be illustrated by presenting a number of examples of common botanical markers such as hypericin, hyperforin, hyperoside, silybin and others. Crucial points encountered during the establishment, documentation and maintenance of these reference,substances will be pointed out.,

**MA2 Detecting the components of botanical mixtures by single-strand conformation polymorphism analysis**,1. University of California-Los Angeles, Department of Molecular, Cell and Developmental Biology, Los Angeles, CA,2. University of California-Los Angeles, Molecular Biology Institute, Los Angeles, CA,3. Loyola Marymount University, Department of Biology, Los Angeles, CA,1. Ann M. Hirsch1,2, ahirsch@ucla.edu,2. Crystal Wu1 ,3. Kelli Henry1 ,4. Michelle R. Lum3 Herbal dietary supplements, also known as botanicals, represent a market that has been growing at a rapid pace over the past 15 years. In the U.S., it is estimated that over 80 million people use some type of botanical supplement, and in 1999, the global market exceeded \$15,billion. Because the FDA does not regulate dietary ,supplements, many consumers worry about the authenticity of the supplements they buy; cases of accidental contamination or purposeful,adulteration have been reported. We developed DNA-based methods to identify the plant species in botanical supplements. In particular, the use of single-strand conformation polymorphisms (SSCP) to differentiate plant species in combination with DNA sequencing enables us to identify the exact species contained within plant mixtures.

**MA3 Identity and authenticity control of complex raw materials in the flavor industry**,1. Symrise GmbH &Co. KG, Flavor &Nutrition Research &Innovation, Holzminden, Lower Saxony, Germany,2. Symrise GmbH &Co. KG, Flavor &Nutrition Quality Control, Holzminden, Lower Saxony, Germany,1. Gerhard E. Krammer1 gerhard.krammer@symrise.com,2. Andreas Degenhardt1 ,3. Stefan Brennecke1 ,4. Uwe Schäfer1 ,5. Gerd Lösing2 ,6. Stephan Trautzsch1 ,7. Berthold Weber1 Advanced tools for the rapid identity check and authenticity control for complex flavor raw materials as well as the analysis of,contaminants is of increasing importance for food and flavor companies. The mega trend for natural ingr edients requires an optimized combination,of effective sample clean-up and target analysis for key compounds. In this context modern adsorption technologies are providing selectivity,adjusted analytical work procedures for direct analysis of difficult matrices such as dairy products and other fat and oil containing raw materials as ,well as complex juice derived materials. For this purpose the polymer adsorption based SymStixx® technology offers a rapid access to a broad spectrum of flavor and taste active materials. The combination of SymStixx® technology with other analytical methodologies such as LC-MS provides a comprehensive picture of the identity and ,authenticity of raw materials with a parallel insight into the sensorial performance in the end application.,

**MA4 Authentication of foods enriched with plant sterols/stanols and their esters**,1. Technische Universitaet Muenchen, Chair of General Food Technology, Germany,1. Karl-Heinz Engel1, K.H.Engel@wzw.tum.de,2. Andreas Barnsteiner1 ,There is a growing number of foods on the market that are enriched with plant-derived sterols/stanols and their fatty acid esters,respectively. Depending on the plants used as sources, the type of sterols/stanols and of the fatty acid moieties contained in the respective esters,may vary considerably. In order to control the compliance of enriched foods with regulatory requirements, rapid methods for the authentication and,the quantitation of sterols/stanols and their esters are required. Protocols allowing fast extractions of sterols/stanols and their esters from different food matrices were developed. Chromatographic separation and,identification of intact steryl/stanyl esters was achieved by means of GC/MS, LC/MS and on-line LC-GC/MS. Quantification was performed in a spectrum of samples from the European market.

**MA6 Varietal screening of quercetin in onions (Allium cepa L.) and onion waste materials for authentication in food fortification**,1. University of California, Davis, Food Science, Davis, CA, ,1. JiHyun Lee1 jihlee@ucdavis.edu,2. Alyson E. Mitchell1 aemitchell@ucdavis.edu ,Onion varieties differ greatly in their quercetin glycoside composition and content; glycoside composition dictates bioavailability and,bioactivity and epidemiological studies show that quercetin plays a role in the protection against cardiovascular disease, cancer, and other,age-related diseases. However, currently there is little understanding of varietal variability and stability of quercetin glycosides in onions. This ,information is needed for authentication of onion varieties. We will present reverse phase HPLC methods for authenticating the varietal variability of,quercetin glycosides in ten commercially important onion varieties grown in California. Values range between 93.11-2299.63 mg/100g dry weight.,The range of quercetin glycosides in onion waste materials was 312.85-1072.34 mg/100g dry weight. The stability of quercetin glycosides in dried onion over 1 year of ambient and refrigerated storage will also be presented.,

**MA7 Multiresidue pesticide analysis of ginseng and other botanical dietary supplements**,1. U.S. Food and Drug Administration, Center for Food Safety and Applied Nutrition, College Park, MD ,1. Jon W. Wong1, jon.wong@fda.hhs.gov,2. Kai Zhang1, kai.zhang@fda.hhs.gov,3. Douglas G. Hayward1, douglas.hayward@fda.hhs.gov,4. Alexander J. Krynitsky1 , alex.krynitsky@fda.hhs.gov,Botanical supplements are used by consumers to improve their health, energy and vitality. Many of these botanicals are farmed by ,conventional agricultural practices which include pesticide application. Pesticide methods are needed but the complexity of these matrices present,difficulties in their analysis. Three multiresidue procedures, QuEChERS, CFIA, and DFG S19, have been modified to analyze pesticides in botanicals. Ginseng was chosen to be tested by these modified procedures because of its consumer popularity and ginseng products have been,known to contain pesticides. The methods were validated for 350 pesticides using GC and

LC-MS. LOQs at the 10-20?g/kg levels were obtained,by GC-MS/MS and HPLC-MS/MS. Recoveries were >70% for most pesticides. These procedures allow for effective monitoring of pesticides at low,detection levels. The goal of this work is to present strategies that would lead to cost-effective and efficient pesticide analysis in botanicals based,on matrix, pesticide, and instrumentation.,

**MA8 Evaluation of disposable pipette extraction (DPX) for the rapid determination of melamine and canuric acid in food,**1. U.S. Food and Drug Administration, Center For Food Safety and Applied Nutrition, College Park, Maryland,2. University of South Carolina, Department of Chemistry and Biochemistry, Columbia, South Carolina.1. Alexander J. Krynitsky1 , Alex.Krynitsky@fda.hhs.gov,2. William E. Brewer2 ,3. Jon W. Wong1 ,4. Jon A. Roach1 ,This presentation will discuss a novel solid-phase extraction technique called disposable pipette extraction (DPX) for the analysis,of melamine and cyanuric acid in foods. DPX is a dispersive solid-phase extraction technique that mixes solutions in a pipette tip to provide rapid,extractions with minimal solvent volumes. By using DPX, extractions can be performed in as little as thirty seconds, as opposed to several minutes,using conventional solid phase extraction. The foods that were evaluated included infant formula and dry products. In this study the solid-phase material, contained in the DPX tip, is a weak anion exchange (WAX) sorbent. A test portion is extracted in 50/50 acetonitrile/water. Proteins are,precipitated in the presence of acetonitrile. Cleanup does not require wash and elution steps, but only aspirate extract, mix with sorbent and dispense into HPLC vial. All test solutions are analyzed by ultra performance liquid chromatography-tandem mass spectrometry (UPLC-MS/MS) with hydrophilic interaction liquid chromatography (HILIC) and electrospray ionization (ESI).

## **MONDAY AFTERNOON March 22 Section B**

### **Nutrigenomics: Food Components and Gene Interactions**

Agnes Rimando, Hyunsook Kim, Wallace Yokoyama, Organizers Agnes Rimando,Wallace Yokoyama, Presiding

1:30 Introductory Remarks.

1:35 73. Identification of transcriptional biomarkers of age and caloric restriction and their modulation by dietary interventions. J. L. Barger, T. A. Prolla, R. Weindruch

2:00 74. Targeting obesity by meso-limbic reward circuitry neurotransmitter and signal transduction manipulation favoring dopamine D2 receptor agonistic activation employing nutrigenomic solutions. K. Blum, B. W. Downs, R. L. Waite, S. Morse, J. Giordano, D. Miller, E. R. Braverman

2:25 75. Modulation of cognition and stress/survival signaling pathways by resveratrol and pterostilbene in age-accelerated SAMP8 mice. G. Casadesus, A. M. Rimando, M. A. Smith, B. Hale, J. Chang, J. Joseph

2:50 Intermission.

3:05 76. Nutrigenomic component of marine biotechnology products for human health. R. Cacabelos

3:30 77. Nutrient-induced modulation of gene expression and cellular functions: Modeling epigenetic regulation in bovine cells. C. Li, R. W. Li, T. H. Elsasser, E. E. Connor

3:55 78. Integration of human health and soft fruit breeding: Bioactivity at the molecular level. D. Stewart

### **MA2 Identification of transcriptional biomarkers of age and caloric restriction and their modulation by dietary interventions 1.**

LifeGen Technologies, LLC, Madison, WI, 2. University of Wisconsin Madison, Departments of Genetics and Medical Genetics, Madison, WI, 3. University of Wisconsin Madison and William S. Middleton Memorial VA Hospital, Department of Medicine, Madison, WI 1. Jamie L Barger1 Jamie.L.Barger@gmail.com 2. Tomas A Prolla2 , 3. Richard Weindruch3 Caloric restriction (CR) is the only intervention known to extend lifespan by slowing the aging process. Whole- genome transcriptional profiling has revealed thousands of genes that are changed in expression by age and CR, but many of these genes may be specific to the genetic background of the organism being studied. In order to identify a panel of genes that are fundamental to the aging process, we used microarrays to identify genes that are consistently changed in expression with age in seven mouse strains. This analysis was performed in four tissues (heart, cerebral cortex, gastrocnemius muscle and adipose tissue) and changes in gene expression were confirmed by RT-qPCR. A similar experiment was performed in the liver to identify a set of genes changed in response to short-term CR. These panels represent robust transcriptional biomarkers which can be used to rapidly screen nutritional interventions that may attenuate the aging process.

### **MA3 Targeting obesity by meso-limbic reward circuitry neurotransmitter and signal transduction manipulation favoring dopamine D2 receptor agonistic activation employing nutrigenomic solutions**

1. University of Florida, College of Medicine, Gainesville, Florida, 2. LifeGen, Inc., Department of Nutrigenomics, San Diego, CA, 3. National Institute For Holistic Addiction Studies, Department of Holistic Medicine, North Miami Beach, Florida, 4. LifeStream, Inc, Prescott, Arizona, 5. Weill Cornell School of Medicine, Department of Neurological Surgery, New York, New York, 1. Kenneth Blum1 drd2gene@aol.com 2. B. William Downs2 , 3. Roger L. Waite2 , 4. Siobhan Morse3 , 5. John Giordano3 , 6. David Miller4 , 7. Eric R. Braverman5 , We evaluated the impact of polymorphisms of five genes (DRD2, MTHFR, 5-HT2a, PPAR-gamma, OB) as targets for the nutraceutical LG839 to combat obesity. Significant results were observed for weight loss, reduction of BMI and late night eating, appetite suppression, sugar craving and snack reduction (P<0.01), increased perception of overeating, enhanced quality of sleep, increased happiness (P<0.05), and increased energy (P<0.001). Polymorphic correlates were obtained for a number of genes (LEP, PPAR-gamma2, MTHFR, 5-HT2A, DRD2) with positive clinical parameters. However, only the DRD2 gene polymorphism (A1 allele) had significant Pearson correlation with days on treatment. In food- and drug-addicted individuals there is "dopamine resistance" due to an association with the DRD2 gene A1 allele. While there are many genes associated with the complexity of behaviors associated with overeating and inability to burn fat, targeting of the DRD2 gene polymorphisms is prudent. We propose that D2 receptor stimulation can be accomplished via the use of KB220, a nutraceutical formulation that induces DA release causing the same induction of D2-directed mRNA and thus proliferation of D2 receptors in the human, which in turn will induce the attenuation of glucose craving behavior. Positive outcomes demonstrated by qEEG imaging in a randomized triple-blind placebo-controlled study showed high Alpha and low Beta activity in protracted abstinence in psychostimulant abusers. Similar findings using IV therapy suggest that KB220's

MOC involves the indirect release of dopamine at the N. accumbens with concomitant reduction in glucose craving. In future experiments we plan to evaluate the potential of KB220 to correct the blunted response in the striatum and orbitofrontal cortex to intake of palatable food and imagined intake, respectively, that is associated with the DRD2 A1 allele in humans (reported by Stice et al., 2008). Overcoming the blunted response to palatable food will reduce overeating, and ultimately induce weight loss.

**MA4 Modulation of cognition and stress/survival signaling pathways by resveratrol and pterostilbene in age-accelerated SAMP8 mice** 1. Case Western Reserve University, Neurosciences, Cleveland, OH, 2. Case Western Reserve University, Pathology, Cleveland, OH, 3. USDA-ARS-HNRCA, Human Nutrition Research Center on Aging, Boston, MA, 4. ARS-USDA, Natural Products Utilization Research, University, MS, 1. Gemma Casadesus<sup>1</sup>, gxc40@case.edu 2. Agnes M Rimando<sup>4</sup>, 3. Mark A Smith<sup>2</sup>, 4. Barbara Hale<sup>3</sup>, 5. Jeawon Chang<sup>1</sup>, 6. James Joseph<sup>3</sup>, To date there are no mouse lines that model late-onset/age-related Alzheimer's disease (AD), the feature which accounts for the vast majority of cases. The senescence-accelerated mouse (SAMP8), a model of aging, displays many features that are known to occur early in the pathogenesis of AD. Therefore, SAMP8 mice may be an excellent model for studying the earliest neurodegenerative changes associated with AD and determine the effectiveness of therapies. Recent studies have implicated resveratrol and pterostilbene, a resveratrol derivative, in the protection against age-related diseases, such as cancer, diabetes, and neurodegenerative diseases in addition to age-related conditions such as cognitive decline, a risk factor for AD. The purpose of this study was to compare the effectiveness of physiologically relevant doses of resveratrol and pterostilbene on age-related cognitive changes and signaling pathways associated with AD. Our findings demonstrate that both resveratrol and pterostilbene, at equivalent doses, were able to upregulate SIRT1. However, pterostilbene and resveratrol differentially modulated stress/survival pathways and pterostilbene was more effective than resveratrol at modulating cognitive function and oxidative stress levels. These findings indicate that pterostilbene is more potent both at a behavior and cellular level. Increased lipophilicity by the substitution of hydroxy with methoxy group in pterostilbene may result in better bioavailability and, therefore, increased biological activity than an equivalent dose of resveratrol

**MA6 Nutrigenomic component of marine biotechnology products for human health** 1. EuroEspes Biomedical Research Center, Institute for CNS Disorders and Genomic Medicine, Bergondo-Corunna, Galicia, 15165, Spain 1. Ramon Cacabelos<sup>1</sup> rcacabelos@eurospes.com A series of novel nutraceutical products have been developed from marine sources. These bioproducts, derived from diverse species, such as *S. pilchardus* (E-SAR-94010), *T. trachurus* (E-JUR-94013), and *S. scombrus* (E-CAB-94011), are obtained with biotechnological procedures that preserve their natural bioactive properties for medical and/or nutritional use. E-SAR-94010 is a powerful lipid lowering compound with anti-atherosclerotic properties, and which displays a nutrigenomic profile. The hypolipemic and anti-atherosclerotic effect of E-JUR-94010 is Apolipoprotein E (APOE)-dependent. Among patients with dyslipidemia, the best responders are those harboring the APOE-3/3 genotype (>APOE-3/4>APOE-4/4). Similarly, APOE-3/3 carriers exhibit a better anti-atherosclerotic effect than APOE-3/4 carriers. Polymorphic variants of genes of the Cytochrome P450 (CYP) superfamily also influence the metabolism and effect of nutraceutical products. The incorporation of nutrigenomics into nutritional programs would bring about a substantial benefit to the general population and groups of risk in terms of prevention, personalized diets, and optimization of nutritional resources.

**MA7 Nutrient-induced modulation of gene expression and cellular functions: Modeling epigenetic regulation in bovine cells** 1. Animal & Natural Resources Institute, ARS, Bovine Functional Genomics Laboratory, Beltsville, MD, 1. Congjun Li<sup>1</sup>, congjun.li@ars.usda.gov 2. Robert W. Li<sup>1</sup> 3. Ted H Elsasser<sup>1</sup>, 4. Erin E Connor<sup>1</sup>, Volatile fatty acids (VFA), especially butyrate, participate in metabolism both as nutrients and as regulators of histone deacetylation. One paradigmatic example of the nutrient-epigenetic-phenotype relationship is that of VFA and their gene expression regulation activities. Our studies indicated that butyrate induces many significant changes in the expression of genes associated with regulatory pathways that are critical to cell growth, immune response and signal transduction. The biologically relevant networks and pathways of these genes were also identified. Our recent studies indicate that VFA induces reactivation of the somatically heritable imprint genes such as IGF2 (loss of imprinting). Butyrate-induced histone acetylation also interferes with miRNA, a group of non-coding short RNAs. Butyrate induced biological effects provide an example of epigenetic regulation of genome and a basis for understanding the full range of the biological roles and the molecular mechanisms that butyrate may play in animal cell growth, proliferation, and energy metabolisms

**MA8 Integration of human health and soft fruit breeding: Bioactivity at the molecular level** 1. Scottish Crop Research Institute, Plant Products and Food Quality, Dundee, Tayside, United Kingdom 1. Derek Stewart<sup>1</sup>, Derek.Stewart@scri.ac.uk The agricultural policies of the developed world have meant that, for these countries at least, food is plentiful but changing eating patterns have seen an increase in the consumption of ready-made meals and food elevated with respect to sugar and fat. The knock-on effect of this is evident in the rapidly increasing level of obesity in the western world and the degenerative diseases such as atherosclerosis, some cancers etc. Components, predominantly polyphenols, in soft fruit have been identified as contributing beneficially with regard to the incidence of these diseases and their progression. There is now a significant and concerted effort between soft fruit breeding programmes, phytochemists and biomedical researchers to underpin and elucidate this bioactivity and feed this information back into the generation of enhanced fruit. The basis of these bioactivities will be presented with a focus on the human genetic and biochemical levels and the subsequent consequences

## **MONDAY AFTERNOON March 22 Section C**

### **Reactive Carbonyl Species and their Health Consequences**

Chi-Tang Ho, Gow-Chin Yen, Mingfu Wang, Shengmin Sang, Organizers Chi-Tang Ho, Gow-Chin Yen, Presiding 1:30 Introductory Remarks.

1:35 79. Adverse effects of dietary glycative products upon health: A mini review. M.-C. Yin

2:00 80. Trace analysis of toxic/reactive carbonyl compounds in various matrices: Overview. J.-K. Moon, T. Shibamoto

2:25 81. Mechanism for the formation of ketones in lipid (linoleate) autoxidation and fluorescent probe to detect ?, ?-unsaturated carbonyls. M. Frenette, M. González-Béjar, P. Campbell, J. C. Scaiano

2:50 Intermission.

3:10 82. Inhibition of advanced glycation-end products through trapping of methylglyoxal by stilbene glycoside from *Polygonum multiflorum* Thunb. L. Lu, X. Shao, L. Wang, S. Sang, C.-T. Ho

3:35 83. Trapping of methylglyoxal, a maillard reaction generated bioactive compound, by black current pigments. C.-Y. Lo, X.-Y. Chen, W. T. Hsuao, S. Li, M.-H. Pan, C.-T. Ho

4:00 84. Application of epigallocatechin gallate to prevent DNA interstrand cross-links caused by reactive carbonyl species. M. Wang, I. K. Chu, J. T. K. To

4:25 85. Inhibitory activities and potential mechanisms of vitamins against carcinogenic acrylamide formation. Z. Xiaohui, C. Ka-wing, J. Yue, L. Zhi-Xiu, S. Jian-Jun, C. Feng, W. Mingfu

4:50 Concluding Remarks.

**MA2 Adverse effects of dietary glycative products upon health: A mini review** 1. China Medical University, Department of Nutrition, Taichung City, Taiwan Republic of China 1. Mei-chin Yin1, mcyin@mail.cmu.edu.tw The impact of dietary Maillard reaction products (MRPs), also called advanced glycation endproducts (AGEs), upon healthy risk has been paid attention because the exogenous AGEs contribute to whole body AGEs pool, which may directly exacerbate systemic glycative stress and favor the deterioration of glycation associated diseases such as diabetes and Alzheimer's disease. The adverse effects of exogenous AGEs upon healthy risk are partially due to the interaction of AGEs with their receptors on the membrane of macrophages and endothelial cells, which subsequently activates mitogen-activated protein kinase and nuclear factor kappa B signaling pathways and further modulates gene transcription for factors response for oxidation, inflammation, adhesion and coagulation. MRPs could be detected in many raw and processed foods. Thus, the source and quantity of these exogenous AGEs should be managed especially for patients with glycation associated diseases. These patients should be educated how to minimize the intake of exogenous AGEs.

**MA3 Trace analysis of toxic/reactive carbonyl compounds in various matrices: Overview** 1. U. of California, Dept of Environmental Toxicology, Davis, California, 1. Joon-Kwan Moon1, jkmoon@ucdavis.edu 2. Takayuki Shibamoto1, tshibamoto@ucdavis.edu Analysis of trace levels of toxic/reactive carbonyl compounds (RCCs), particularly low molecular weight compounds such as formaldehyde, acetaldehyde, acrolein, malonaldehyde, glyoxal, and methylglyoxal, is extremely difficult because they are highly reactive, water soluble, and volatile. However, analysis of these RCCs in trace levels is significantly important to assess the food safety because they are major products of lipid peroxidation, which is strongly associated with various diseases such as cancer, Alzheimer's disease, HIV, diabetes, and atherosclerosis as well as aging. This overview covers the development and application of various derivatives for RCC analysis. Among the many derivatives prepared, cysteamine, N-methylhydrazine, and o-phenylene diamine derivatives were selected for extended discussion. The application of advanced instruments, including GC/NPD, GC/MS, and LC/MS, to the determination of trace RCCs in different oxidized lipid samples such as fatty acids, skin lipids, beef fats, blood plasma, whole blood, and liver homogenates, is also outlined.

**MA4 Mechanism for the formation of ketones in lipid (linoleate) autoxidation and fluorescent probe to detect?,? -unsaturated carbonyls** 1. Univ. of Ottawa, Dept of Chemistry, Ottawa, Canada 1. Mathieu Frenette1, Stanford Univ., Dept of Chemistry, Stanford, CA mfren@stanford.edu 2. María González-Béjar1 3. Philip Campbell1 mfren@stanford.edu 4. J. C. Scaiano1, mfren@stanford.edu The primary products of polyunsaturated lipid oxidation are hydroperoxides and the mechanisms involved in their formation are well established. If free radical oxidation is allowed to continue,?,? -unsaturated ketones appear. We propose a simple mechanism for the formation of?,? -unsaturated ketones from their corresponding lipid hydroperoxide. The mechanism also shows that highly reactive hydroxyl radicals (HO·) are formed during metal-independent lipid autoxidation. In addition, a fluorescent probe to detect?,? -unsaturated ketones (and aldehydes) formed during lipid oxidation will be presented. We found that a 7-mercapto coumarin probe is initially non-fluorescent (?f~0.05) but the fluorescence increases after nucleophilic attack by the probe to ?,? -unsaturated ketones (?f>0.6).

**MA6 Inhibition of advanced glycation-end products through trapping of methylglyoxal by stilbene glycoside from *Polygonum multiflorum* Thunb** 1. Nanjing Normal Univ, Food Science and technology, Nanjing, Jiangsu, China 2. Rutgers Univ, Department of Food Science, New Brunswick, NJ, 3. North Carolina Central Univ, Julius L. Chambers Biomedical/ Biotechnology Research Inst, Kannapolis, NC, 1. Lishuang Lu1 llishuang@nccu.edu 2. Xi Shao3, 3. Liyan Wang3, lwang@nccu.edu 4. Shengmin Sang3, ssang@nccu.edu 5. Chi-Tang Ho2, Methylglyoxal (MGO), the reactive dicarbonyl intermediates generated during the nonenzymatic glycation between reducing sugars and amino groups of proteins, lipids, and DNA, is the precursor of advanced glycation end products (AGEs). Many studies have shown that AGEs play a major pathogenic role in diabetes and its complications. In this study, we found that 2, 3, 5, 4 $\epsilon$ -tetrahydroxyl stilbene 2-O-b-D-glucoside (THSG), the major bioactive compound from *Polygonum multiflorum* Thunb, could efficiently inhibit the formation of AGEs through trapping reactive MGO in a dose-dependent manner under physiological conditions (pH 7.4, 37 °C).

**MA7 Trapping of methylglyoxal, a maillard reaction generated bioactive compound, by black current pigments** 1. National Chiayi University, Department of Food Science, Chiayi City, Taiwan Republic of China 2. Rutgers University, Department of Food Science, New Brunswick, NJ, 3. National Kaohsiung Marine University, Department of Seafood Science, Kaohsiung, Taiwan Republic of China 1. Chih-Yu Lo1 chihyulo@mail.ncyu.edu.tw 2. Xiu-Yu Chen1, 3. Wen Tuan Hsuao1, 4. Shiming Li2, 5. Min-Hsiung Pan3, 6. Chi-Tang Ho2, It has been reported that the reactive carbonyl species (RCS) such as glyoxal (GO) and methylglyoxal (MGO) were generated from in vitro and in vivo systems. Their levels are higher in plasma, serum and urine of diabetic patients. These highly reactive species can react with proteins in tissues and lead to the formation of advanced glycation products (AGEs) in diabetes mellitus. Catechins and theaflavins, the natural polyphenols in green and black tea, had been demonstrated to have high potential as carbonyl scavengers. In our recently study, dry and dark purple blackcurrent fruit powder which contained high amount of anthocyanidins was shown the trapping ability in MGO phosphate buffer solution model system. The stability of anthocyanidins and MGO trapping ability were further explored.

**MA8 Application of epigallocatechin gallate to prevent DNA interstrand cross-links caused by reactive carbonyl species** 1. The University of Hong Kong, School of Biological Sciences, Hong Kong Special Administrative Region of China 1. Mingfu Wang , jamesto@hkucc.hku.hk Ivan K Chu , ivankchu@hku.hk James Tsz Kin To, jamesto@hkucc.hku.hk DNA interstrand cross-link (ICL) represents a severe type of DNA damage. Recent studies showed that reactive carbonyls, such as acrolein, crotonaldehyde and glyoxal, produce ICLs which are detected in live specimen. ICLs are believed to interfere with a normal cell's DNA replication and transcription processes and are likely to be associated with the mutagenicity and carcinogenicity of these reactive carbonyls. Our present study showed that epigallocatechin gallate (EGCG), the major catechin present in green tea leaves, prevents ICL formation caused by acrolein, crotonaldehyde and glyoxal. HPLC-DAD analysis showed that EGCG can significantly prevent these carbonyl species from reacting with DNA monomers, such as deoxyguanosine. Ethidium bromide fluorescence assay indicated that with addition of millimolar concentration of epigallocatechin catechin, the number of ICLs per DNA molecule is significantly reduced comparing with negative control. This finding enriches our knowledge of possible benefits of tea drinking habits.

**MA9 Inhibitory activities and potential mechanisms of vitamins against carcinogenic acrylamide formation** 1. University of Hong Kong, Department of Biological Sciences, Hong Kong Special Administrative Region of China 2. Hong Kong Baptist University, Hong Kong Special Administrative Region of China 3. Chinese University of Hong Kong, Hong Kong Special Administrative Region of China 1. ZENG Xiaohui , tcmgarden@yahoo.com.cn 2. Cheng Ka-wing 3. Jiang Yue 2 , 4. Lin Zhi-Xiu 3 5. Shi Jian-Jun 2 , 6. Chen Feng 1 , 7. Wang Mingfu 1 , In our study, the capacities of 15 vitamins in reduction of acrylamide formation were examined. Two model systems and one real food product model was applied for testing 15 vitamins of their activities against acrylamide formation. It was found that water-soluble vitamins performed much better than fat-soluble vitamins, and niacin, biotin, pyridoxine and pyridoxamine exerted potent activities against acrylamide formation in the model systems. Further testing was done in real fried potato product, and as a result, 51% and 34% of acrylamide inhibitory effects were observed for niacin- and pyridoxine-treated fried potato strips, respectively. As niacin demonstrated the strongest activity against acrylamide formation in both model systems and real food product, we further studied its inhibitory mechanism against acrylamide formation. It was found that niacin can direct trap acrylamide to form novel acrylamide-niacin adducts. The structures of the novel adducts were solved by interpretation of LC/MS/MS and NMR data. Thus we discover a novel inhibitory mechanism of niacin against acrylamide formation.

**MONDAY EVENING 8:00 - 10:00 Moscone Center N. DaCosta Organizer, Presiding**

**TUESDAY MORNING March 23 Section A**

**Fermented Foods**

David Kyle and Fereidoon Shahidi Organizer, Presiding

8:15 Introductory Remarks.

8:20 86. Challenges in establishing efficacy in probiotic research trials. D. Kyle

8:45 87. Stability of probiotics in powder products. F. Abe

9:10 88. Probiotics as a functional ingredient: Challenges, opportunities and the promise of tomorrow. BM Peeters

9:35 Intermission.

9:50 89. Microencapsulated probiotics: Bacterial cells for colon cancer prevention and therapy. S. Prakash

10:15 90. Application of red mold rice in preventive medicine. T.-M. Pan

10:40 91. Probiotics: Industrial challenges and opportunities. G. Leyer

**TM2 Challenges in establishing efficacy in probiotic research trials** 1. Kyle Consulting Services, Gualala, CA, David Kyle , DHA4ME@aol.com Understanding the action of probiotic bacteria in the GI tract of humans represents a complex research challenge. Unlike a single chemical entity pharmaceutical used to establish a clearly measurable pharmacological outcome, probiotic bacteria produce a complex array of chemical signals that vary depending on the physiological status of the probiotic bacteria themselves, and which are modulated by their interaction with other gut flora and/or the host cells. Meaningful clinical trials to establish probiotic efficacy are as dependent on the judicious selection of endpoints, as they are on the trial design itself. A critical evaluation of the starting material in terms of dose and stability is necessary to establish the efficacy and ultimate use of a particular product in order to establish use claims. As probiotic use moves into the mainstream of clinical health maintenance, we will need to clearly establish what different probiotics can or cannot do.

**TM3 Stability of probiotics in powder products** 1. Morinaga Milk Industry Co., Ltd, Science & Technology Institute, Japan 1. Fumiaki Abe 1 , abe@morinagamilk.co.jp Background: In this study, kinetic analyses of the stability of probiotic bifidobacteria in powder products were performed to define the characteristics of survival. Method: Commercial bifidobacteria powder was mixed with starch having various water activities and stored at temperatures ranging from 5°C to 60°C. The kinetic analyses of the stability were investigated. Also, the stabilities of three bifidobacteria strains in commercial powdered formula were evaluated. Results: Inactivation rate constants of the test powder under various storage conditions were obtained from regression analyses of the survival data. A significant positive correlation was observed between water activity and natural logarithm of the inactivation rate constant for each storage temperature. Also, the stabilities of bifidobacteria in powdered formula were different among strains. Conclusion: Kinetic analyses based on stability tests were useful for the construction of the prediction models of bifidobacteria survival.

**TM4 Probiotics as a functional ingredient: Challenges, opportunities and the promise of tomorrow** 1. USBPE@chr-Hansen.com, Health and Nutrition Division, San Francisco, CA, 1. Brian M. Peeters 1 , USBPE@chr-Hansen.com Over the past 20 years, the use of probiotics in foods and nutraceuticals has steadily been gaining acceptance by the mainstream public and attracting the attention of doctors, researchers and academics throughout the world. With people now experiencing more digestive issues than ever before, probiotics, with their clinically-documented effects on improving digestive and immune health, have captured the global nutraceutical ingredient spotlight. Ensuring stability and shelf-life of probiotics in foods, beverages and dietary supplements still remains the preeminent concern amongst RD professionals within their respective industries. As technologies continue to be developed to address these issues, consumers will benefit

from the inclusion of documented, live beneficial microorganisms in products across broad categories. The opportunities ahead for the probiotic category are vast. Products such as probiotic yogurt and dietary supplements will continue to experience healthy growth, while new products will address targeted health concerns, such as oral health, satiety and eczema.

**TM6 Microencapsulated probiotics: Bacterial cells for colon cancer prevention and therapy** 1. McGill U., Dept of Biomedical Engineering, Montreal, Quebec, Canada 1. Satya Prakash1, satya.prakash@mcgill.ca The burden of colon cancer in Western countries is overwhelming, amounting to 50,000 deaths per year in USA alone. Although previous studies have shown that yogurt and probiotic foods have anti-inflammatory properties and may lead to overall reduction of gastro-intestinal diseases there is a problem of sufficient therapeutic dosage delivery to the GI targets. The aim of our study was to design Lactobacillus acidophilus microcapsule formulations and to investigate their use in oral deliveries using yogurt as a platform for therapeutic bacterial cells delivery. We assessed the anticancer activity by screening a number of biomarkers in the digesta obtained from the duodenum, jejunum, proximal and distal segments of the ileum of male C57BL/6J-ApcMin/+ mice. The levels of pro-inflammatory cytokines as well as serum C-reactive protein were significantly lower in treated animals. Western blots showed a 71% down-regulation of Cox-2 protein in treatment group animals compared with control.

**TM7 Application of red mold rice in preventive medicine** 1. National Taiwan University, Department of Biochemical Science and Technology, Taipei, Taiwan Republic of China 1. Tzu-Ming Pan1, tmpan@ntu.edu.tw Monascus, commonly known as red mold rice (RMR), is fermented rice on which Monascus purpureus has been grown. It has been a traditional Chinese food additive for thousands of years and is used in preventive medicine. Monascus purpureus NTU 568 produced high quantities of monacolin K at a level of 9500 mg/kg. RMR was able to decrease total cholesterol (TC), triacylglycerol (TG), and low density lipoprotein cholesterol (LDL-C) when added to hyperlipidemic hamster diet as a powder at 10.78 mg/day/100 g bw for 4 weeks. The decrease was 31.2, 30.1 and 36.0%, respectively. A further decrease of 22.0, 17.9 and 20.7%, respectively, was noted at week 8. RMR supplementation also resulted in an anti-fatigue agent in male adult Wistar rats and also acted as an anti-obesity agent in the same subjects. Furthermore, RMR acted as an anti-Alzheimer material and prevented accumulation of A-beta fibrils in the brain. Thus, RMR is a multifunctional food with many health benefits.

**TM8 Probiotics: Industrial challenges and opportunities** 1. Danisco USA Inc., Madison, WI 1. Gregory Leyer1 greg.leyer@danisco.com The study and eventual commercialization of probiotics continue to grow. As new beneficial uses become documented through properly designed clinical trials, and the request for probiotic products continue to span the dietary supplement, food, and beverage spectrum, significant challenges remain for an industrial supplier. This talk will briefly describe the industrial culture growth challenges in terms of providing strains that meet current stability and allergen standards, discuss the current regulatory environment, and provide insight into new clinical uses for future applications.

## **TUESDAY MORNING March 23 Section B**

### **Reactive Carbonyl Species and their Health Consequences**

Chi-Tang Ho, Gow-Chin Yen, Mingfu Wang, Shengmin Sang, Orgs Mingfu Wang, Shengmin Sang, Presiding  
8:30 Introductory Remarks.

8:35 92. Combined effect of light and omega-3 polyunsaturated fatty acid fortification on the oxidative stability of milk proteins. F. Mestdagh, B. Kerkaert, B. De Meulenaer, T. Cucu

9:00 93. Effect of glycation in the presence or absence of soluble wheat proteins on major whey allergens. T. Cucu, B. Devreese, B. De Meulenaer, B. Kerkaert, I. Vandenberghe

9:25 94. Amino acid degradation by lipid-derived reactive carbonyls. R. Zamora, F. J. Hidalgo

9:50 Intermission.

10:10 95. Formation and fate of  $\alpha$ -dicarbonyl compounds in honey and Maillard model systems. V. A. Yaylayan, E. Marceau, F. L. Chu

10:35 96. Furan formation in baby food model systems from vitamin C and unsaturated fatty acids. A. Owczarek-Fendor, B. De Meulenaer, G. Scholl, P. Yohendrarajah, A. Adams, F. Van Lancker, G. Eppe, E. De Pauw, M.-L. Scippo, N. De Kimpe

11:00 Concluding Remarks.

**TM2 Combined effect of light and omega-3 polyunsaturated fatty acid fortification on the oxidative stability of milk proteins** 1. Ghent U., Faculty of Bioscience Engineering, Dept of food safety and food quality, Ghent, Belgium 1. Frédéric Mestdagh1, 2. Barbara Kerkaert1, barbara.kerkaert@ugent.be 3. Bruno De Meulenaer1,4. Tatiana Cucu1, There is an increasing interest in the fortification of foods with omega-3 polyunsaturated fatty acids (PUFA's) because of their known health benefits. Dairy products are a suitable group for fortification since they are frequently consumed, however due to the susceptibility of PUFA's to oxidation, questions arise about the oxidative stability of these fortified milk products. Moreover dairy products, as such, are already vulnerable to lipid and protein oxidation because of the presence of the photo sensitizer, riboflavin, which facilitates the generation of reactive carbonyl compounds. Little is known about the combined effect of light and lipid fortification on the stability of milk. Therefore this study investigated the effect of oils with different oxidative stability (algae, fish, soybean, olive oil) on various modifications of whey proteins in the presence of light and riboflavin.

**TM3 Effect of glycation in the presence or absence of soluble wheat proteins on major whey allergens** 1. Ghent University, Department of Food Safety and Food Quality, Ghent Belgium 2. Ghent University, Department for Biochemistry and Microbiology, Ghent, Belgium 1. Tatiana Cucu@UGent.be 2. Bart Devreese2, Bart.Devreese@UGent.be 3. Bruno De Meulenaer1, Bruno.DeMeulenaer@UGent.be 4. Barbara Kerkaert1, Barbara.Kerkaert@UGent.be 5. Isabel Vandenberghe2, Isabel.Vandenberghe@UGent.be Cow's milk and dairy products are major nutrients in human diet, especially during infancy. However, cow's milk is an allergenic product. Whey proteins are largely used as ingredients in food preparations which poses a serious threat to milk allergic

consumers. It is known that food processing may modify the proteins and as a consequence the allergenicity. Therefore the aim of the present study was to investigate the influence of glycation on the major whey protein's allergens. Glycation in the presence or absence of soluble wheat proteins led to dramatic changes in whey proteins in terms of formation of protein bound carbonyls, losses of reactive lysine residues and free amino groups, formation of fluorescent compounds and brown polymer along with severe aggregation. Further, MALDI-TOF MS and MS/MS analysis were used to get a better insight into the real changes induced in whey allergens as a result of glycation.

**TM4 Amino acid degradation by lipid-derived reactive carbonyls** 1. Instituto de la Grasa, CSIC, Department of Food Characterization and Quality, Seville, Spain 1. Rosario Zamora1 rzamora@ig.csic.es 2. Francisco J. Hidalgo1 , fhidalgo@ig.csic.es Lipid-derived reactive carbonyls are produced under physiological conditions as a consequence of oxidative stress. The modification of proteins by these compounds has been related to the etiology or the consequences of numerous illnesses. In addition, these compounds have been shown to play a role in the degradation of amino acids. As a continuation of these last studies, this presentation will describe the different reactivity of epoxyalkenals, hydroxyalkenals, and oxoalkenals for amino acid degradation. In particular, their role in the conversion of amino acids into Strecker aldehydes, alpha-keto acids, biogenic amines, and vinilogenous derivatives will be discussed. Reaction mechanisms and conditions for all these reactions will be analyzed.

**TM6 Formation and fate of? -dicarbonyl compounds in honey and Maillard model systems** 1. McGill University, Food Science and Agricultural Chemistry, Ste Anne de Bellevue, Quebec, Canada 1. Varoujan A Yaylayan1 varoujan.yaylayan@mcgill.ca 2. Eric Marceau1 , Mr. 3. Fong Lam Chu1 , Reactive? -dicarbonyl compounds can originate from various sources containing reducing sugars. They are responsible for the formation of many important Maillard reaction products generated in food. Some? -dicarbonyl compounds are associated with toxicity and immunosuppressive effects while others with antioxidant and aroma properties. Studies have shown that most of the known? -dicarbonyl compounds can arise from reducing sugars under long-term storage conditions such as in honey or under short term heating conditions. Isotope labeling studies have indicated that in the presence of amino acids, some? -dicarbonyl compounds can under amino acid-assisted chain elongation reactions to generate longer-chain analogs. Such thermally generated?-dicarbonyl compounds in the presence of amino acids can undergo further reactions and generate heterocyclic compounds. On the other hand, long-term room temperature storage conditions, such as in honey, can promote accumulation of? -dicarbonyl compounds and/or their further transformation into other? -dicarbonyl derivatives equal or shorter in chain length.

**TM7 Furan formation in baby food model systems from vitamin C and unsaturated fatty acids** 1. Ghent University, Faculty of Bioscience Engineering, Department of Food Safety and Food Quality, Ghent, Oost-Vlaanderen, Belgium 2. Ghent University, Faculty of Bioscience Engineering, Department of Organic Chemistry, Ghent, Oost-Vlaanderen, Belgium 3. University of Liège, Faculty of Sciences, Department of Chemistry, Mass Spectrometry Laboratory, Liege, Belgium 4. University of Liège, Faculty of Veterinary Medicine, Department of Food Science, Laboratory of Food Analysis, Liege, Belgium 1. Agnieszka Owczarek-Fendor1, Agnieszka.Owczarek@UGent.be 2. Bruno De Meulenaer1 , 3. Georges Scholl3 , 4. Pratheeba Yohendrarajah1 , 5. An Adams2 , 6. Fien Van Lancker2 , 7. Gauthier Epe3 , 8. Edwin De Pauw3 , 9. Marie-Louise Scippo4 , 10. Norbert De Kimpe2 , Furan, classified as "possibly carcinogenic" to humans in Group 2B by IARC has been found in an unexpected number of heat treated foods. The furan generation has been associated with thermal degradation of vitamin C, carbohydrates, proteins, and polyunsaturated fatty acids via formation of multiple reactive carbonyl species. In this study, the furan formation in vitamin C and fats containing model food systems similar to baby food was investigated. The results obtained for vitamin C indicated that sample volume, pH, type of buffer ions and addition of proteins affected the furan formation. Moreover, the presence of starch enhanced in a drastic way the furan generation. Studies with fats showed that the furan formation from fresh oils was very limited while it increased for oxidized oils, especially if alpha-linolenic acid was present. Therefore, it seems that the oxidative status and the fatty acid composition of the oil affected the furan generation.

## **TUESDAY MORNING March 23 Section C**

### **Biocatalysis for Biofuels and Bioproducts**

(Cosponsors: Div of Cellulose & Renewable Materials, Div of Agrochemicals, Chemistry for a Sustainable World)

Dominic Wong, Joseph Laszlo, Organizers, Presiding

8:20 Introductory Remarks.

8:30 97. High value bioproducts from the sea: Marine byproducts turned into attractive biomaterials via proteolytic processing. L. Beaulieu, J. Thibodeau, P. Bryl, M.-E. Carbonneau

8:55 98. Multiple site anticancer activity of a pentapeptide from rice bran. A. Kannan, N. S. Hettiarachchy, J. O. Lay, R. Liyanage

9:20 99. Hydrolytic and redox biocatalysis for lipid-based biofuels and bioproducts. P. Wang

9:45 100. Lipids for health and beauty: Enzymatic modification of vegetable oil. J. A. Laszlo, K. O. Evans, D. L. Compton, M. D. Appell, K. E. Vermillion

10:10 101. Use of xylanolytic carbohydrate esterases as tools for biomass transformation to value-added products. P. Christakopoulos, E. Topakas

10:35 102. Natural-derived mediators for oxidative enzymatic transformation of lignins. M. Díaz-González, T. Vidal, T. Tzanov

### **TM2 High value bioproducts from the sea: Marine byproducts turned into attractive biomaterials via proteolytic processing**

1. Université du Québec à Rimouski, Department of Biology, Chemistry and Geography, Rimouski, Québec 2. Université Laval, Institute of Nutraceuticals and Functional Foods, Québec, Québec, Canada 3. Aquatic Products Technology Centre (CTPA, MAPAQ), Gaspé, Québec, Canada 1. Lucie Beaulieu1,2 , Université du Québec à Rimouski, Department of Biology, Chemistry and Geography, 300 allée des Ursulines, Rimouski, Québec, Canada , lucie\_beaulieu@uqar.qc.ca 2. Jacinthe Thibodeau1 , 3. Piotr Bryl3 , 4. Marie-Élise Carbonneau3

Research on marine byproducts demonstrated that they constitute a source of promising health benefit molecules, which include lipids, proteins, polysaccharides and minerals. Proteolytic processing allows for extraction of these diverse biomolecules with commercial proteases, such as Protamex®. As a consequence, our investigation was undertaken to evaluate the feasibility of applying a pilot scale enzymatic hydrolysis process of marine by-products. For example is snow crab exploited on the East Coast of Canada, followed by fractionation, in order to recover enriched high-valued compounds. All the fractions obtained may be of interest as health promoting agents, dietary protein and as lipid or mineral supplements. Effectively, the snow crab oil constitutes a rich source of EPA and DHA omega-3 fatty acids. In addition, most protein enriched fractions demonstrate a well-balanced amino acid composition, notably the most essential amino acids. Hence, many nutraceutical potential application benefits for promoting human health is possible with the bioactive compounds found from processing snow crab by-products

**TM3 Multiple site anticancer activity of a pentapeptide from rice bran** University of Arkansas, Department of food science, Fayetteville, AR, 2. University of Arkansas, Department of Chemistry and Biochemistry, Fayetteville, AR, 1. Arvind Kannan1, akannan@uark.edu 2. Navam S Hettiarachchy1 3. Jackson O Lay2, 4. Rohana Liyanage2, Biocatalysis food- grade optimization to produce bioactive peptides from heat-stabilized defatted rice bran has resulted in a pure pentapeptide having multiple site anticancer activity. Minimal hydrolysis and gastrointestinal juices treatment followed by fractionation resulted in <5 and 5-10kDa fractions that caused growth arrest in colon, breast, lung and liver cancer cell types in vitro. Purification from <5kDa fraction involving ion exchange chromatography followed by reverse phase HPLC resulted in isolating a single peptide that demonstrated enhanced anti-cancer activity, viz. 84% inhibition on colon, 80% on breast and 84% on liver cancer cells. Mass spectrometry analysis and tandem mass spectrometry using post-source decay fragmentation analysis revealed a mass of 685.378Da and sequence Glu-Gln-Arg-Pro-Arg (EQRPR). An efficient and reproducible biocatalytic technology to utilize underutilized co-product such as rice bran to produce anticancer value-added bioactive peptide has been established. This should promote further research as applicable to food and pharmaceutical industry as a natural ingredient.

**TM4 Hydrolytic and redox biocatalysis for lipid-based biofuels and bioproducts** U. of Minnesota, Bioproducts and Biosystems Engineering; Biotechnology Institute, St Paul, MN, 1. Ping Wang1, U. of Minnesota- TC, Bioproducts Biosystems Eng, 2004 Folwell Ave., St Paul, MN, ping@umn.edu In developing the next generation biofuels, we should consider not only alternative biomass resources, but also diversified products and processing technologies that can afford more efficient industrial manufacturing. Toward that, enzymes have been shown being versatile and increasingly competitive. This presentation reports our recent studies in biocatalysis engineering for lipid-based biofuels and bioproducts. Lipases with enhanced organic compatibility can efficiently catalyze transesterification reactions for syntheses of biodiesel and biosurfactants from lipids in anhydrous media. Enzymatic oxidation reactions also offer great potentials in deriving lipid-based products. Glycerol dehydrogenase enables intensified production of dihydroxyl acetone (DHA) from glycerol in an integrated bioelectrochemical reactor, while enzymatic epoxidation of lipids promises the synthesis of bioplastics with controllable Tg's.

**TM5 Lipids for health and beauty: Enzymatic modification of vegetable oil** National Center for Agricultural Utilization Research, USDA, Peoria, IL, 1. Joseph A. Laszlo1, NCAUR, USDA, Peoria, IL, joe.laszlo@ars.usda.gov 2. Kervin O. Evans1, 3. David L. Compton1, 4. Michael D. Appell1 5. Karl E. Vermillion1, Dr. Ferulic acid has been extensively investigated for its potential as a cosmetic and pharmaceutical agent. We have prepared lipophilic derivatives of ferulic acid by a simple, enzyme-catalyzed transesterification reaction of ethyl ferulate with vegetable oils. Immobilized *Candida antarctica* lipase B, operating under solvent-free reaction conditions, showed excellent long-term stability during pilot-scale production. The reaction produces several feruloylated mono- and diacylglycerols, but the predominant species is the mono-feruloylated diacylglycerol. Feruloyl dioleoylglycerol (FDOG) was enzymatically synthesized using this process, and then isolated from the product mixture. FDOG was found to have good antioxidant capacity, as determined by the DPPH radical scavenging assay. FDOG incorporated in phospholipid vesicles showed that this molecule did not perturb vesicle integrity and continued to display its inherent antioxidant property. Conformational analysis demonstrated that FDOG assumes a very open conformation in the bilayer with the phenolic moiety in close proximity to the polar portion of the phospholipids.

**TM6 Use of xylanolytic carbohydrate esterases as tools for biomass transformation to value-added products** National Technical University of Athens, Chemical Engineering, Athens, Attiki, Greece 1. Paul Christakopoulos1, hristako@chemeng.ntua.gr 2. Evangelos Topakas1, Hemicellulolytic enzymes include two types of microbial carbohydrate esterases (CE), feruloyl esterases (FAEs) and acetyl xylanesterases (AcXEs). These enzymes have the ability not only to deconstruct plant biomass but also to synthesize novel bioactive components. Enzymatic esterification of phenolic acids has been rarely reported, as in general, enzymatic esterification offers an alternative to the poor selectivity of chemical synthesis. Esterification could be obtained using FAEs, which were proved to be able to catalyze the transfer of the feruloyl group to L-arabinose resulting in the first example of enzymatic feruloylation of a carbohydrate. AcXEs are found in 8 of 16 CE families ([http://www.cazy.org/fam/acc\\_CE.html](http://www.cazy.org/fam/acc_CE.html)). The members of the CE-2 family show in both hydrolytic and synthetic action a regioselective mode distinct from that of AcXEs and appear to be enzymes specialized for 6-O-deacetylation of gluco- and mannopyranosyl residues. This novel regioselectivity was also found for the acylation of oligo- and polysaccharides.

**TM7 Natural-derived mediators for oxidative enzymatic transformation of lignins** Universitat Politècnica de Catalunya, Department of Chemical Engineering, Terrassa, Barcelona, Spain 2. Universitat Politècnica de Catalunya, Department of Textile and Paper Engineering, Terrassa, Barcelona, Spain 1. María Díaz-González1, maria.diaz.gonzalez@upc.edu 2. Teresa Vidal2, tvidal@etp.upc.edu 3. Tzanko Tzanov1, tzanko.tzanov@upc.edu The industrial use of laccase- mediator systems in numerous biotechnological and environmental applications imposed the need for an economic, effective and environmentally safe mediator. Sixteen phenolic compounds, of which fourteen are naturally occurring, that could feature these characteristics were evaluated as potential mediators for laccase assisted bleaching of pulp. The ability of these compounds to work as mediators was studied by means of cyclic voltammetry and HPLC in presence of lignin model compounds. The mechanistic information derived from the reactivity of benzylic alcohols with these laccase/mediator systems would further elucidate the process of biocatalytic oxidative delignification. Some of these phenolic compounds have been applied with success for either biobleaching or functionalizing of different kinds of natural fibres.

## **TUESDAY MIDDAY March 23 Section E**

### **Sterling B. Hendricks Memorial Lectureship**

(Cosponsors: Divi of Agrochemicals, United States Department of Agriculture, Agricultural Research Service)

Michael Tunick, Kim Kaplan, Stephen Duke Organizers

Stephen Duke, Presiding

11:30 Award Presentation.

11:45 103. Development of cellulosic biofuels. C. R. Somerville

12:45 Reception.

**Development of cellulosic biofuels** 1. Energy Biosciences Institute, University of California Berkeley, Melvin Calvin Laboratory, Berkeley, CA 1. Chris R. Somerville<sup>1</sup>, crs@berkeley.edu. Because plants can be deployed on a large scale to capture and store solar energy, one way of moving toward the development of carbon neutral energy sources is to use plant biomass for production of fuels. The efficient production of biofuels by routes other than gasification will require innovation in three main areas: sustainable, production of feedstocks that do not compete with food production, depolymerization of feedstocks, and conversion of feedstocks to fuels. In this respect there is renewed interest in identifying plants that have optimal biomass accumulation and understanding the production issues associated with large-scale cultivation and sustainable harvesting, of such species. Additionally, the importance of enhancing soil carbon and nutrient retention while minimizing inputs will require an integrated approach to the development of cellulosic energy crops. The challenges on the processing side include the development of improved chemical or biological catalysts for polysaccharide and lignin depolymerization, conversion to fuels, the development of microbial strains that can convert a wide range of sugars to next generation, fuels under harsh conditions, and numerous innovations in chemical engineering.

## **TUESDAY AFTERNOON March 23 Section A**

### **Fermented Foods**

David Kyle, Fereidoon Shahidi, Organizers, Presiding

1:00 104. Phenolics and other bioactives of fruit vinegars. F. Shahidi

1:25 105. Effect of cranberry vinegar on the prevention of cardiovascular diseases: A human clinical trial. CK Wang

1:50 106. Elucidation of formation pathways of bio-active compounds in fermented foods via isotope enrichment technique. M. Granvogl, P. Schieberle

2:15 107. Use of fermentation to prepare black soybean as a healthy food possessing multifunctional properties.

C.-C. Chou

2:40 108. Functionality of Japanese rice wine, Sake. Y. Hata

3:05 Intermission.

3:20 109. Fermented soy isoflavones and human health. D. Bagchi

3:45 110. Changes of polyphenols in fermented teas. C.-T. Ho

4:10 111. Lipid oxidation and quality attributes of Dutch style fermented sausages with fish oil and quercetin. N. M.

Josquin, J. P. H. Linssen

4:35 112. Flavor chemistry of fermented fish sauce. K. R. Cadwallader, H. Kim

5:00 Concluding Remarks.

**TA1 Phenolics and other bioactives of fruit vinegars** 1. Memorial University of Newfoundland, Department of Biochemistry, St. John's, NL, Canada 1. Fereidoon Shahidi<sup>1</sup>, fshahidi@mun.ca Fruit vinegars serve as a preservative, condiment and a source of a myriad of bioactives with potential health benefits. Sugars in fruits are converted to alcohol during fermentation assisted by yeast and further conversion of alcohols to acetic and other acids by bacteria. The phenolics present in vinegars, along with a number of acids, were found to originate from the source material, or the precursor wines and could also be generated via process-induced changes. The content of phenolic compounds, in general, dictated the antioxidant activity of products, but there were also exceptions to this rule. Balsamic, plum and grape vinegars followed by raspberry and apple had the highest to lowest total content of phenolics. Rice vinegar, however, had the least content of phenolics. Presence of phenolics and a number of organic acids, including polyhydric ones, may render beneficial health effects.

**TA2 Effect of cranberry vinegar on the prevention of cardiovascular diseases: A human clinical trial** 1. Chung Shan Medical University, Taichung, Taiwan, Taiwan Republic of China 1. Chin-Kun Wang<sup>1</sup>, wck@csmu.edu.tw The effects of cranberry vinegar on blood lipid regulation and antioxidation were evaluated. Forty healthy subjects with higher serum lipid (twenty men and twenty women) were involved in this study. This was a randomized, double blind, and placebo-controlled study. All subjects were randomized into experimental group (taking cranberry vinegar) and control group (taking placebo drink). The duration of this study was ten weeks, each subject taking 400 ml of cranberry vinegar (or placebo) every day. Blood sample collection and anthropometric measurements were obtained every two weeks. After ten weeks of administration of cranberry vinegar, the antioxidant status of subjects was greatly increased. In addition, the amounts of total thiols and glutathione were also elevated. Oxidative lag time of low density lipoprotein (LDL) was significantly delayed. The serum triacylglycerol, total cholesterol and LDL cholesterol were significantly decreased. This indicated that intake of cranberry vinegar may reduce the incidence of cardiovascular diseases.

**TA3 Elucidation of formation pathways of bio-active compounds in fermented foods via isotope enrichment technique** 1. Technical U. of Munich, Chair of Food Chemistry, Garching, Bavaria, Germany Michael Granvogl<sup>1</sup> michael.granvogl@lrz.tum.de 2. Peter Schieberle<sup>1</sup> It is well-known that during the fermentation process many aroma compounds are enzymatically formed from precursors, which have no flavor sensation themselves. But beside these flavorings, the overall aroma impression of a fermented product can also be influenced by a possible (following) heat-processing step, e.g. coffee or cocoa beans. The lecture will present qualitative and quantitative data of aroma compounds formed during the fermentation process. These results will be compared to the flavor formation, which occurs

during heat-processing of the respective fermented food to get information about the importance of enzymatic and/or thermal reactions to the overall flavor. Additionally, formation pathways will be presented on the basis of labeling experiments using isotope enrichment technique. In the last part, the formation of desired aroma-active compounds and of undesired "food-borne" toxicants (acrylamide, furan) will be compared, e.g. in coffee beans fermented under different conditions (humidity, temperature, time, oxygen content).

**TA4 Use of fermentation to prepare black soybean as a healthy food possessing multifunctional properties** 1. National Taiwan University, Graduate Institute of Food Science & Technology, Taipei, Taiwan Republic of China 1. Cheng-Chun, fstcchou@ntu.edu.tw A solid state fermentation was performed by growing *Aspergillus awamori*, a food grade fungus, on steamed black bean at 30° for 3 days. Fermentation was noted to cause a marked increase in the content of aglycone isoflavone (daidzein, glycitein and genistein), the bioactive isoflavone, along with a major reduction in the content of  $\beta$ -glucosides. The percentage of aglycone to total isoflavone in the fermented-black soybean was found to be 21.8%, showing a 7.8 fold increase after fermentation. The DPPH radical-scavenging effect and the Fe<sup>2+</sup>-chelating ability exhibited by the fermented black soybean is about 2.6 and 2.2 folds greater than that of the unfermented black soybean, respectively. Additionally, methanol extract of the fermented black soybean was also found to exhibit a significantly higher ( $P < 0.05$ ) antimutagenicity against 4-nitroquinoline-N-oxide, a direct mutagen and Benzo[a]pyrene, an indirect mutagen, on Salmonella Typhimurium TA100 and TA 98 than did the extract of unfermented black soybean. These results revealed that fermentation with *A. awamori* can be employed to prepared black soybean as a healthy food with multifunctional properties.

**TA5 Functionality of Japanese rice wine, Sake** 1. Gekkeikan Sake Co. Ltd, Research Institute, Kyoto, Japan 1. Yoji Hatai y\_hatai@gekkeikan.co.jp It was described in Chinese old history books that "Sake is the chief of all medicine". Clearly, sake, Japanese rice wine, may not only be drunk in order to enjoy its relaxing effects but also as a foodstuff contributing to a healthy life. Recent scientific research has revealed various active ingredients and physiological effects pointing to functionality of sake. Therefore the beverage deserves promotion as an evidence-based functional food. < anti-hypertensive effect > We isolated 6 kinds of ACE (angiotensin-converting enzyme) inhibitory peptides from sake, and demonstrated anti-hypertensive effect of these peptides by administration to SHR (spontaneously hypertensive rats). According to amino acid sequences, these peptides were derived from rice protein with hydrolysis during sake

**TA7 Fermented soy isoflavones and human health** 1. InterHealth Research Center, Benicia, CA, 2. University of Houston College of Pharmacy, Houston, TX, 1. Debasis Bagchi<sup>1,2</sup>, InterHealth Research Center, InterHealth Research Center, InterHealth Research Center, Benicia, CA, Fermented soy isoflavones, also referred to as phytoestrogens, have a broad spectrum of health benefits against a range of degenerative diseases including menopausal disorder, bone fracture and osteoporosis, and hormone- and nonhormone-related cancers. A significant number of fermentation products including probiotic bacteria, kurosu (black rice vinegar), shoyu (soy sauce), miso (soybean-barley), natto and tempeh are produced by traditional methods that exploit mixed cultures of various non-toxic microorganisms and extensively popular in Japan and becoming increasingly popular worldwide. The microorganisms include lactic acid bacteria, acetic acid bacteria, sake yeast, koji molds and natto bacteria. It has been indicated that increased consumption of soyfoods may contribute to the relatively low rates of breast, colon, and prostate cancers in countries such as China and Japan. A number of in vitro, animal, and epidemiological data support the hypothesis that increased soy intake reduces cancer risk. Fermented soy is a unique dietary source of the isoflavone genistein, which possesses weak estrogenic activity and has been shown to act in animal models as an antiestrogen. Genistein is also a specific inhibitor of protein tyrosine kinases and inhibits DNA topoisomerases and other critical enzymes involved in signal transduction. Genistein suppresses the growth of a wide range of cancer cells, with IC<sub>50</sub> values of 5-40 microM. A significant number of in vivo studies of experimental carcinogenesis in which diets containing soy or soybean isoflavones were employed, 17 (65%) reported protective effects. The epidemiological data are also inconsistent with these in vitro and in vivo data. Protective effects were observed for both hormone- and nonhormone-related cancers. These data demonstrated the broad spectrum diverse benefits of fermented soy isoflavones in human health and disease prevention.

**TA8 Changes of polyphenols in fermented teas** Rutgers University, Department of Food Science, New Brunswick, NJ, 1. Chi-Tang Ho<sup>1</sup>, ho@aesop.rutgers.edu Tea is the second most widely consumed beverage in the world after water. Considerable interest has been devoted in the past decade to unravel the health beneficial effects of teas, particularly their polyphenolic components and their antioxidant activities. There are three major categories of tea: the nonfermented green tea, the partially fermented oolong tea, and the fully fermented black tea. Catechins, theaflavins and thearubigins are three important groups of polyphenols present in tea. We will discuss the formation mechanism of these compounds during tea processing as well as their respective biological activities. These polyphenols are of great importance in terms of both scientific and commercial interest

**TA9 Lipid oxidation and quality attributes of Dutch style fermented sausages with fish oil and quercetin** 1. Wageningen University, Department of Product Design and Quality Management, Wageningen, The Netherlands 1. Nicole M Josquin<sup>1</sup>, 2. Joseph P.H. Linssen<sup>1</sup>, Jozef.Linssen@wur.nl Dutch style fermented sausages were manufactured with a substitution of 15% and 30% pork backfat by fish oil in pure or encapsulated form, either added as such or as pre-emulsified mixture with soy protein isolate. Furthermore, half of the sausages were enriched with quercetin (around 200 ppm) to find additional antioxidant effects. Slices (6 mm) of the products were packaged in a high oxygen atmosphere (65%) and stored in the dark at 7 °C up to 10 weeks. The pH of the sausages ranged from 4.3 to 4.6, indicating a proper fermentation. Lipid oxidation parameters (TBARS, propanal, hexanal) showed much higher values in sausages prepared with pure fish oil than in products with encapsulated oil. Lipid oxidation in controls and sausages with added encapsulated oils was more or less similar. Addition of quercetin did not seem to have a pronounced effect. Products with encapsulated oil and pre-emulsified fish oil showed significantly higher values for firmness in physical and sensory analysis than formulations containing pure fish oil, while other quality attributes were the same. During storage, changes in colour occurred. Formulations with fish oil obtained a greyish-brown colour, while controls and formulations with encapsulated oil maintained the original red colour.

## **TUESDAY AFTERNOON March 23 Section B**

### **Organic Foods: Interpreting Science & Understanding Facts Related to Human Health Agronomic Impacts**

(Cosponsored by Division of Agrochemicals, Chemistry for a Sustainable World)

Alyson Mitchell, Ingolf Gruen, James Seiber, Organizers, Presiding

1:30 Introductory Remarks.

1:35 113. Organic vs. conventional food production, and impacts on composition and quality of food: The evolving peer reviewed science. J. N. Seiber, L. A. Kleinschmidt

2:00 114. Organic vs. conventionally grown "Rio Red" whole-grapefruit and juice: Comparison of production inputs, market quality, consumer acceptance, and human-bioactive compounds. G. E. Lester

2:25 115. Are nanotechnologies and organics fundamentally incompatible?. J. V. Stone

2:50 Intermission.

3:05 116. Organic foods: Consumer expectations and flavor issues. I. U. Gruen

3:30 117. Natural products in weed management: A review. F. Dayan

3:55 118. Influence of agricultural farming practices and commercial processing on nutrient density. A. Mitchell

4:20 Panel Discussion.

#### **TA2 Organic vs. conventional food production, and impacts on composition and quality of food: The evolving peer reviewed science**

1. University of California, Davis, Department of Food Science & Technology, Davis, CA, 2. University of California, Davis, Department of Environmental Toxicology, Davis, CA, 1. James N. Seiber1 lakleinschmidt@ucdavis.edu 2. Loreen A. Kleinschmidt2 , lakleinschmidt@ucdavis.edu

Environmental factors and agronomic practices can affect the chemical composition of crops and other plants. Fertilization, irrigation, soil preparation and quality, amendments, season, temperature, sunlight intensity are among many factors that need to be taken into account when comparing phytochemical content of plants grown under different conditions and in different areas. Studying the effects of individual factors, such as organically produced food crops, requires close attention to variables that might affect the end product and confound interpretation. This paper will describe recently published studies that have addressed the outcomes of organic vs conventional practices on such quality parameters as antioxidant content, vitamin content, resistance to pest and disease, and flavor and aroma characteristics. Articles published in the Journal of Agricultural and Food Chemistry and other outlets will be discussed in order to evaluate the state of the science, including methodology for studying complex interactions and their effect on specific groups of chemicals that may be important to the quality of crop-derived products

#### **TA3 Organic vs. conventionally grown "Rio Red" whole-grapefruit and juice: Comparison of production inputs, market quality, consumer acceptance, and human-bioactive compounds**

1. USDA, ARS, Beltsville, MD, 1. Gene E Lester1 , USDA-ARS, Food Quality Laboratory, Beltsville, MD, gene.lester@ars.usda.gov Retail demand for organic produce has been increasing 25% per annum due to consumer's perceived dangers of pesticide residues and that organic produce is better tasting and more nutritious. Claims that organic produce is better tasting and more nutritious than non organic (conventional) produce are largely unsubstantiated. This is due mainly to a lack of rigor in matching common production variables of both production systems; such as microclimate, soil type, previous crop, irrigation source, plant age, and cultivar. When, common production variables were matched in a comparison of commercially-grown conventional and certified-organic red-fruited grapefruit, conventional fruit was found to be better colored, higher in lycopene, less tart, lower in naringin, and better tasting than organic. However, organic fruit had a commercially preferred thinner peel, was higher in vitamin C (citric acid) and sugars, and lower in the drug interactive bergamottin compounds and the negative health compound nitrate.

#### **TA4 Are nanotechnologies and organics fundamentally incompatible?**

1. Michigan State University, Institute for Food and Agricultural Standards, East Lansing, MI, 1. John V. Stone1, jvstone@msu.edu In March of 2009, the Materials Handling Committee of the USDA's National Organic Standards Board (NOSB) requested public comment on the use of nanotechnology in organics. The Committee subsequently presented recommendations to the NOSB to prohibit nanotechnology in organic production, processing, and packaging. This presentation examines potential applications of nanotechnologies throughout the organic supply chain, and the intended purposes they would serve in the organic sector. It considers the ethical foundations and social contexts of stakeholder arguments in support of and opposition to particular nanotechnology applications serving particular purposes at particular points in the organic supply chain. It argues that stakeholder appeals to an 'organic virtue' standard prohibiting nanotechnology will likely override the explicitly utilitarian appeals of some stakeholders in support of limited nanotechnology applications, for example, nano-enabled sensing and detection applications to detect and deter organic fraud, verify organic quality claims, and thus promote the virtues of organic agriculture.

#### **TA6 Organic foods: Consumer expectations and flavor issues**

1. University of Missouri, Food Systems and Bioengineering, Columbia, Missouri, 1. Ingolf U. Gruen1 grueni@missouri.edu The niche market for organic foods is still growing fast, and advocates claim that organic foods are not only more flavorful but also have a better flavor than non-organically grown foods. This presentation will highlight some research that looks at the veracity of both claims. A major limitation of many studies is the issue of the proper definition of "organic". Nevertheless, even in studies where the term organic was well defined, evidence for the superiority of organic foods was slim. While some studies were able to differentiate between selected organic and non-organic foods, others were not. In addition, the preference for organic or non-organic foods appears to be more dependent on the familiarity of the consumer with the actual food and its similarity to what consumers are accustomed to rather than fact if the food is organically grown or not.

#### **TA7 Natural products in weed management: A review**

1. USDA/ARS, Natural Products Utilization Research Unit, University, MS, fdayan@ars.usda.gov Weed management has been a major problem since the inception of agriculture because weeds have a greater negative impact on crop yields than any other agricultural pests. Modern cultural practices rely heavily on the use of synthetic herbicides. However, public concerns about the potential health and environmental impacts of the use of synthetic pesticides have resulted in a recent surge in the popularity organic agriculture. The control of weeds is the most pressing pest management issue in organic agriculture, primarily because of

the lack of natural alternative to synthetic herbicides. Most organic methods rely on soil cultivation, hand hoeing, biocontrol, organic mulches, plastic (synthetic) ground cover, and the use of some non-selective (vinegar, fatty acids, and essential oils) burndown natural products. The use and limitations of various natural products available for weed management under organic agriculture will be discussed. A new product consisting of essential oils rich in natural triketones causes bleaching of the foliage of treated plants. This product can be applied as a foliar herbicide and cause growth inhibition via inhibition of this the enzyme p-hydroxyphenylpyruvate dioxygenase (HPPD). HPPD is a key enzyme in the biosynthesis of prenyl quinones. Its inhibition reduces plastoquinone levels with deleterious effects on carotenoid synthesis and photosynthesis. This is very unique, since most other natural herbicides are non-selective contact (burn-down) herbicides with no systemic effects, allowing plants to recover. Adding a small amount of the triketone-rich essential oils

**TA8 Influence of agricultural farming practices and commercial processing on nutrient density** 1. University of California, Davis, CA1. Alyson Mitchell1 , aemitchell@ucdavis.edu The science of food is experiencing a paradigm shift toward a fully integrated approach to ensure an abundant, environmentally sustainable and healthful food supply. From a nutritional point of view, this “farm to fork ideal relies on understanding phytochemical composition and basic chemical reactions that occur in fruits and vegetables as a result of pre- and post-harvest processes. Secondary plant metabolites (SPMs) are particularly interesting in this regard as they are responsible for flavor quality, functionality and biological activity of foods. In plants, SPMs function in defense mechanisms and levels are strongly influenced by genetics, resource availability, soil quality, climate and UV radiation. Although there is continuing debate over the nutritional advantage of organic foods, especially at the consumer level, there is general agreement that fundamental differences between organic and conventional production systems, particularly in soil management, have the potential to impact the nutritive composition of plants. We will discuss the results from several agronomic studies including a 10-year comparison of flavonoid levels in tomatoes obtained from the Long Term Research on Agricultural Systems project at UC Davis and a comparison of nitrates.

## **TUESDAY AFTERNOON March 23 Section C**

### **Biocatalysis for Biofuels and Bioproducts Lignocellulosics**

(Cosponsors: Div of Cellulose & Renewable Materials, Div of Agrochemicals, Chemistry for a Sustainable World)  
Dominic Wong, Joseph Laszlo, Organizer, Presiding

1:30 119. Tango for two: Biomass recalcitrance – enzymatic deconstruction. A. J. Ragauskas

1:55 120. Lignocellulosic biomass particle morphology during enzymatic hydrolysis. C. J. Dibble, J. J. Stickel

2:20 121. Improvement of the reactive intermediate production for a novel biochemical platform for fuels and chemicals production from cellulosic biomass. Z. Fan, W. Wu, R. Zhang, T. Kasuga, X. Xiong

2:45 122. Pectin degrading enzymes in plant biomass valorization. A. G. J. Voragen, S. Kühnel, Y. Westphal, N. Sengkhamparn, H. Gruppen, H. A. Schols

3:10 Intermission.

3:25 123. Improving the hydrolysis and derivatization of cellulose using ionic liquids. H. Zhao, G. A. Baker, J. V. Cowins, Z. Song, O. Olubajo

3:50 124. Towards structure-function relationship of microbial carbohydrate esterases. P. Biely

4:15 125. Functional characterization of two distinct xyloglucanases from rumenal microflora. D. W. S. Wong, V. J. Chan, A. A. McCormack, S. B. Batt

**TA1 Tango for two: Biomass recalcitrance - enzymatic deconstruction** 1. Georgia Institute of Technology, BioEnergy Science Center, Inst of Paper Science and Technology, School of Chemistry and Biochemistry, Atlanta, GA, 1. Arthur J arthur.ragauskas@ipst.gatech.edu The conversion of biomass to biofuels has become a central research theme that needs to be successfully address for mankind to address issues of climate change, energy security and the green industrial revolution. The biological conversion of plant polysaccharides to monosaccharides is critically dependent on the nature of the plant cell wall and its alterations during pretreatment. The latter technology is critically needed currently for efficient bioprocessing but it is also well acknowledged to be the most costly stage in the overall conversion of biomass to biofuels. Ironically, it is also the one technology that least understood from a fundamental biomass chemistry perspective. This seminar will examine the fundamental chemistry of lignin, hemicellulose and cellulose and how genetically engineered changes in plant cell structure can simplify pretreatment technologies and enhance enzymatic deconstruction. This presentation summarizes these advances and illustrates future developments for the next generation of innovative biorefineries.

**TA2 Lignocellulosic biomass particle morphology during enzymatic hydrolysis** 1. National Renewable Energy Laboratory, National Bioenergy Center, Golden, CO, 1. Clare J Dibble1 clare.dibble@nrel.gov 2. Jonathan J Stickel1 , Lignocellulosic biomass could be used to produce renewable transportation fuels, such as ethanol, but a sustainable, cost-effective conversion process remains elusive. Our biochemical process includes dilute-acid pretreatment of non-edible plant matter, enzymatic catalysis of cellulose and hemicellulose to sugars, and fermentation into fuels. Particle size and shape distributions that result from pretreatment and enzymatic hydrolysis are related to conversion and material handling. We develop and validate a set of image processing tools to quantify particle morphology. Increasing pretreatment severity generally leads to smaller particle sizes, decreases flowability at a given solids loading and increases the difference between digestibility in dilute and concentrated conditions. However, mechanical particle size reduction, when performed in a manner that reduces aspect ratio, does not meaningfully increase digestibility nor reduce yield stress within the range tested.

**TA3 Improvement of the reactive intermediate production for a novel biochemical platform for fuels and chemicals production from cellulosic biomass** 1. University of California, Biological and Agricultural Engineering, Davis, CA, 2. University of California, Department of Plant Pathology, Davis, CA, 3. USDA-ARS, Davis, CA, 1. Zhiliang Fan1 , Prof., University of California, Biological and Agricultural Engineering, CA, jzfan@ucdavis.edu 2. Weihua Wu1 , 3. Ruifu Zhang1 , 4. Takao Kasuga2,3 , 5. Xiaochao Xiong1 , One significant obstacle impeding the large scale production of fuels and chemicals from cellulosic biomass is the lack of a low cost processing technology. The conventional biochemical platform for biorefinery involves five distinct steps: pretreatment, enzymatic hydrolysis,

fermentation, and product recovery. Sugars are produced as the reactive intermediate for the subsequent fermentation. Steps involved with overcoming the recalcitrance of cellulosic biomass (pretreatment, cellulase production, and enzymatic hydrolysis) are the three most costly steps in the whole process. Here we propose a novel biochemical platform for fuels and chemical production that will replace the two most costly steps in the conventional platform with a single biological step. Cellulolytic microorganism(s) that can secrete all the enzymes needed to hydrolyze cellulose and hemicellulose in spite of the presence of lignin will be modified to convert most of the carbohydrate contained in the cellulosic biomass to sugar aldonates. In a second step, sugar aldonates will be utilized as the carbon source to produce ethanol and other products. We aim to develop the new platform using the conversion of the cellulose contained in the cellulosic biomass to ethanol as the model system and using *Neurospora crassa* as the model microorganism. Cellobionate is produced as the reactive intermediate for ethanol production. The new platform can potentially lower the cost of cellulosic bioprocessing substantially. In this study, we report the enhancement of reactive. This study we report the enhancement of the cellobionate production by knocking down more copies of  $\beta$ -glucosidase and over-expressing cellobiose dehydrogenase.

**TA4 Pectin degrading enzymes in plant biomass valorization** 1. Wageningen University, Department of Agrotechnology and Food Sciences, The Netherlands 1. A.G.J. Voragen<sup>1</sup>, Wageningen University, Department of Agrotechnology and Food Sciences Wageningen, Wageningen, The Netherlands, The Netherlands, Fons.Voragen@wur.nl 2. S. Kühnel<sup>1</sup>, 3. Y. Westphal<sup>1</sup>, 4. N. Sengkhamporn<sup>1</sup>, 5. H. Gruppen<sup>1</sup>, 6. H.A.Schols<sup>1</sup>, Pectic substances represent an important part of the cell wall material of particularly dicotyledonous plants. Pectic substances are made up of a variety of structural subunits and the variation in the proportions in which these subunits are present in specific plant species or parts of plant species is large. In the valorization of plant biomass to value added products, chemical, biochemical and or physical modification and deconstruction of the plant cell wall are essential and crucial steps. These modifications and deconstruction processes can result in different physical behavior of the biomass leading to more sustainable processes, better handling, better recovery of valuable constituents from the plant tissue, new products like better functional dietary fiber, prebiotic digests, fermentable monosaccharide's for energy carriers and feedstuff for new "green" platform chemicals. For the optimal utilization of other cell wall components like hemi-celluloses and cellulose complete degradation of the pectic matrix is a prerequisite for making these substrates better accessible for the complex of hemicellulolytic and cellulolytic enzymes. Many enzymes have been identified and characterized involved in the modification and degradation of the pectic complex. Also, the tremendous progress in the analysis of oligo- and polysaccharide has greatly contributed to the elucidation of the chemical fine structure of the pectin complex and in characterizing the substrate specificity and mode of action of these enzymes. With our increased knowledge of the chemical fine structure of the pectic complex also novel enzymes were found and within classes of specific pectic enzymes further differentiation became possible based on differences in substrate specificity. Also the huge development in molecular biology and bio-informatics has enabled the identification of the genes encoding for the known enzymes enabling cloning and over expression but also to genes encoding for not yet known enzymes.

**TA6 Improving the hydrolysis and derivatization of cellulose using ionic liquid** 1. Savannah State University, Department of Chemistry, Savannah, GA, 2. Oak Ridge Nat'l Laboratory, Chemical Sciences, Oak Ridge, TN, 1. Hua Zhao<sup>1</sup>, zhaoh@savannahstate.edu 2. Gary A. Baker<sup>2</sup>, 3. Janet V. Cowins<sup>1</sup>, 4. Zhiyan Song<sup>1</sup>, 5. Olarongba Olubajo<sup>1</sup>, New ether-functionalized ionic liquids based on acetate anions are capable of dissolving many substrates including cellulose; meanwhile, they are compatible with the lipase. Due to these uniquely combined properties, these ionic liquids have been explored in two major areas of applications: (1) The regenerated cellulose from these ionic liquids is more susceptible to the enzymatic hydrolysis into reducing sugars. We have demonstrated that switchgrass pretreated by ionic liquids was hydrolyzed into D- glucose and D-xylose at much faster rates than the untreated substrate. These preliminary data have further suggested that ionic liquid pretreatments of cellulosic biomass can be a promising alternative method for the cellulosic ethanol production. (2) The lipase-catalyzed conversions of cellulose and D-glucose become possible in ionic liquids. We have shown that high concentrations of cellulose or glucose dissolved in ionic liquids can be enzymatically converted into respective esters. This enables the homogeneous derivatizations of these carbohydrates using enzymes.

**TA7 Towards structure-function relationship of microbial carbohydrate esterase** 1. Institute of Chemistry, Slovak Academy of Sciences, Bratislava, Slovakia 1. Peter Biely<sup>1</sup>, Dr., Institute of Chemistry, Slovak Academy of Sciences, Department of Enzymology of Carbohydrates, Dubravská cesta 9, Alkaline pretreatment of plant biomass loosens the plant tissue structure by destroying not only the hydrogen bonds holding the polymers together, but also by hydrolyzing the ester linkages and cross-links, making glycosidic linkages accessible to the attack by glycoside hydrolyses. Microorganisms, unable to apply alkaline pretreatment, produce esterases that hydrolyze ester linkages that involve carbohydrates both as alcohols or acids. These enzymes, called carbohydrate esterases (CEs), currently classified in 16 families (CAZy), are frequently found as parts of modular proteins containing carbohydrate binding modules. 3D-structures of most of the families are available, but we do not know enough about their real function. The greatest diversity in molecular organization occurs mainly in eight families of acetylxylan esterases. Recent studies of substrate and positional specificity and ability to catalyze reverse reactions of these enzymes helped to understand the structure-function relationship and assess their potential use in bioconversion of lignocellulosics and carbohydrate chemistry.

**TA8 Functional characterization of two distinct xyloglucanases from rumenal microflora** 1. Western Regional Research Center, USDA-ARS, Albany, CA, 1. Dominic W. S. Wong<sup>1</sup>, Dominic.Wong@pw.usda.gov 2. Victor J Chan<sup>1</sup>, 3. Amanda A McCormack<sup>1</sup>, 4. Sarah B Batt<sup>1</sup>, Xyloglucans are known to function by binding to cellulose microfibrils, crosslinking adjacent fibers forming cellulose-XG networks important for modulation of rigidity and extensibility of the primary cell wall of plants. Enzymatic hydrolysis and modification of xyloglucans has received considerable interest for biotechnological applications particularly in increasing the digestibility of cellulose for more efficient biomass conversion. Recent studies have isolated two xyloglucanases (XEG5A and XEG5B) from rumenal microbes, which possessed an (? /?) 8 fold typical of GH family 5. The cleavage patterns on tamarind xyloglucan and oligoxyloglucans suggested one being an endo- and the other exo-enzyme. The XEG5B protein molecule consisted of a loop segment blocking one end of the active site, which potentially provided the enzyme with exo-action. Kinetics and inhibition studies also revealed that each of the two enzymes had uniquely different biochemical characteristics.

## TUESDAY AFTERNOON March 23 Section D

### General Posters

- Neil Da Costa, Organizer                      Neil Da Costa, Michael Appell, Presiding
- 10925 Bisphenol A in canned soft drink products sold in Canada Cao, Xu-Liang
- 11265 Iron as an essential cause of the fishy sensation in wine and seafood pairings Tamura, Takayuki
- 11405 Effects of beer-battering on the frying properties of wheat or rice batters and their coated foods Shih, Fred
- 11744 Improved extraction and analysis of lipids after acid or base hydrolysis Ullah, SM Rahmat
- 10087 Rheological and microstructural changes in Queso Fresco during storage Tunick, Michael
- 24050 Method of creating starch-like ultra-fine rice flour and effect of spray drying on formation of free fatty acid Guraya, Harmeet
- 12265 Effects of operation parameters on the supercritical fluid extraction of oleuropein from olive tree (*Olea europea*) leaves Sahin, Selin
- 12678 Investigation of extract obtaining methods from olive tree (*Olea europea*) leaves: The effect of ethanol Bilgin, Mehmet
- 15160 Aromatic herb phenolic content and iron source effects of off-color "specks" developed in the cooking of iron fortified pasta Glorio, Patricia
- 16475 Determination of steviol glycosides in sugar substitutes by HPLC-UV and -ELS detection Hurum, Deanna
- 12170 Development of a headspace solid phase microextraction-gas chromatography method for the characterization of volatile compounds in Sufus Chiang, Tsz Kei
- 24063 Effects of melamine on the Maillard reaction between lactose and phenylalanine Ma, Jinyu
- 24144 Sulfur-containing components from pineapple (*Ananas comosus*) Zheng, Zong-Ping
- 24384 Treatment of propolis with supercritical carbon dioxide to remove some allergenic esters Aliboni, Andrea
- 24544 Effects of moisture content and puffing pressure on the extraction yield and saponin contents of puffed *Platycodon grandiflorum* Kim, A Young
- 24547 Monitoring the ginsenoside profile of raw, white, red and black ginsengs Shin, Ji Hye
- 25257 Isolation and identification of unknown compounds from puffed red ginseng Ko, Mi Rim
- 25865 Optimization of processing conditions for cold storage and heated Chunbokjang with abalone Moon, Changyong
- 25912 Phytochemicals in silky dogwood (*Cornus amomum*) fruit Seeram, Navindra
- 26245 Fructans and age relationship in *Agave tequilana* Weber var. azul Erika, Mellado-Mojica
- 26252 Fructan metabolism in *Agave tequilana* Weber var. azul during its productive life cycle Erika, Mellado-Mojica
- 26218 Simple two-phase solvent system preparation of tectoridin from *Puerariae flos* Ibrahim, Salam
- 26279 Extraction, separation, identification and determination of the antioxidant activity of triterpenes from skin of *Poria cocos* Ibrahim, Salam
- 26289 RP-HPLC-ESI-MS/MS analysis of oligomeric procyanidins in sorghum episperm from China Ibrahim, Salam
- 26292 Effects of different processing methods on quality of soybean milk Ibrahim, Salam
- 26317 Purification and anti-inflammatory capacity of dicaffeoylquinic acids in yerba mate (*Ilex paraguariensis*) dry leaves Potts, Gregory
- 26487 Turnover of red wine grape anthocyanins cultured in vitro Chassy, Alexander
- 26494 Deep ultraviolet light-emitting diodes (DUV-LEDs): A novel approach to determine wavelength response curves Britz, Steven
- 26657 Use of natural antioxidants to prevent the degradation of oils and formation of toxic reactive aldehyde products Mitchell, Jami
- 11908 Antioxidative and anti-inflammatory effects of caffeic acid and naringenin on streptozotocin-induced diabetic mice Kam, Wing Yiu
- 14839 Effects of *Fructus Ligustri Lucidi* on lipogenic hormones and antioxidative enzymes in mice obesity Liu, Wenhua
- 14876 Protective effects of *Solanum muricatum* Ait extract in mice diabetes Wang, Zhi-hong
- 15479 Protective effects of histidine and carnosine in mice consuming saturated fat Shih, Ying
- 19601 Andrographolide-induced Pi class of glutathione S-transferase gene expression via PI3K/Akt pathway in rat primary hepatocytes Lu, Chia-Yang
- 19240 Inhibition effects on  $\alpha$ -glucosidase by xanthenes from the fruit barks of *Garcinia mangostana* Oh, KyeongYeol
- 19232 C-Geranyl flavonoids from *Paulownia tomentosa* fruits displaying potent neuraminidase inhibition Cho, Jung Keun
- 24172 Protective effects of proanthocyanidins on insulin signaling pathways impaired by methylglyoxal in 3T3-L1 adipocytes Peng, Xiaofang
- 24269 Inhibition of *Candida* spp. and *Cryptococcus neoformans* by cranberry extracts (*Vaccinium macrocarpon*) Patel, Kunal

24306 Simultaneous determination of unconjugated metabolites of trenbolone acetate and 17beta-estradiol in bovine serum by liquid chromatography-tandem mass spectrometry Cai, Qingsong

25804 Topical anti-inflammatory agents from *Artemisia umbelliformis* Lam., an edible alpine flavoring plant Tubaro, Aurelia

26039 Agave fructans prevent bone loss by stimulating bone formation López, Mercedes

26091 Capture and detection of natural populations of *E. coli* from freshwater using immune-magnetic nanoparticles Rastogi, Shiva

26291 Antitumor activity of rice bran polysaccharides extracted by different methods Ibrahim, Salam

26296 Antidiabetic effect of the fruit of *Siraitia grosvenori*, the natural sweetener Mao, Shilong

11172 Antiangiogenic peptides production through bovine and human plasminogen proteolysis and anticancer activity analysis Stefanutti, Erin

12393 Accumulation of methylglyoxal leads to growth arrest in glutathione-deficient cells of *Dictyostelium discoideum* Park, Seong-Jun

15730 Development of a Luminex® immunoassay for simultaneous detection of Shiga toxins and *Escherichia coli* O157 in ground beef Bernard IV, Clay

23703 Identification of important food pathogens using LNA (Locked Nucleic Acid) probes Hrdlicka, Patrick

24328 Identifying Cytochrome P450 3A4 isoenzyme activity in CHO cells treated with choline bitartrate Repollet-Otero, Christian

25716 Sensitivity of lactic acid bacteria as a biomarker for the early detection of toxins in milk Hathurusinghe, Madhavi

25689 IgY Based double antibody sandwich ELISA for the detection of gliadin in foods Sunwoo, Hoon

26131 IgY Celiac study: Antigliadin specific IgY formulation and its functional property in simulated gut environment Gujral, Naiyana

26156 Optimization of an enzyme-linked immunosorbent assay and sample clean-up for the analysis of 17-b estradiol in poultry litter Wegst, Stacia

26157 Study of the effect of different physical treatments on the formation of bovine alpha-lactalbumin nanoparticles by the desolvation method Arroyo-Maya, Izlia

18851 Quantitative UPLC-MS/MS method for the determination of native 5-methyl-tetrahydrofolate and polyglutamyl derivatives in raw vegetables and vegetable juice Wang, Chao

26508 Bovine milk based infant formula promotes growth and acid production of probiotics Mohamedali, Khalda

26536 Antimicrobial effect of copper alone or in combination with lactic acid on growth of *Escherichia coli* O157:H7 in laboratory media and on the surface of lettuce and tomatoes Gyawali, Rabin

26562 Incidence and level of *Listeria monocytogenes* and other *Listeria* spp. in ready to eat meat products in Jordan Ibrahim, Salam

26863 Discovery of a new class of 3'-phosphoadenosine-5'-phosphosulfate reductase from the methanarcheon *Methanocaldococcus jannaschii* Lee, Jong-Sun

13780 Pesticides levels in wines from the Niagara region of Canada Rawn, Dorothea

13814 Dislodgeable foliar residues: Initial deposition on various crops in California Beauvais, Sheryl

14964 Analysis of lipase-catalyzed enzymatic reactions for the production of renewable and biodegradable compounds Surinenaite, Birute

18201 Evaluation of *Centaurea americana* as a potential biodiesel oilseed crop Paiva, Nancy

22746 Rate of potassium application alters the antioxidant activity and phenolic composition of basil (*Ocimum basilicum* L.) Niemeyer, Emily

24329 Analysis of PBDEs, PCBs, and lipids in steelhead (*Oncorhynchus mykiss*) and liquid fish fertilizer Flores, Orielyz

25442 Environmental stress alters tocopherols and isoflavones in soybean seeds Britz, Steven

26394 Evaluation of wax carriers for the controlled release of pheromones for mating disruption in an integrated pest management program Atterholt, Cynthia

26706 Solid-liquid extraction of biomass feedstocks grown under saline irrigation Yu, Chaowei

26901 Crude glycerol and raw and waste acylglycerides as starting materials to prepare chlorohydrin and allyl esters with industrial applications Eras, Jordi

25611 Physicochemical properties of non-thermally acetylated and cross-linked cornstarches with POCl<sub>3</sub> using ultra high pressure Park, Jin Woo

25615 Physicochemical properties of non-thermally acetylated and cross-linked cornstarches with STMP using ultra high pressure Chotipratoom, Suntitham

25616 Physicochemical properties of non-thermally hydroxypropylated and cross-linked cornstarches with POCl<sub>3</sub> using ultra high pressure Lim, Sang Soo

25618 Physicochemical properties of non-thermally hydroxypropylated and cross-linked cornstarches with STMP using ultra high pressure Kim, Chang Won

25862 Characterization of protease of over-ripe fruits and their utilization using the optimization technique Koak, Ji Hye

22731 Analyzing food and water with magnetic levitation Mirica, Katherine

25632 Studies of the lignins of the bamboo species *Phyllostachys imcarnata* Wen Sun, Run

15127 New method for determination of trace molybdenum in food Yu, Hua-Hong

26282 Synthesis and characterization of cationic starch flocculation prepared by a dry process with mechanically activated treatment Ibrahim, Salam

26411 Characterization of colorants in fungal exudates, and enhancement of color by enzymes Chung, Hau Yin

25820 Melt processing of zein with polyvinylpyrrolidone and Cloisite® nanoclay Woods, Kristen

25849 Production of capsaicin-loaded nanoparticles for functional food delivery system by microfluidization Kim, Chong-Tai

25870 Development of less-allergenic nutrients based on gelatinization of cereals Yano, Hiroyuki

26194 Measurement of some physical and chemical properties of reconstituted skim milk powder at high temperatures using dialysis membranes Tsikritzi, Roussa

26268 Comparison of different immobilized systems in the removal of peanut allergens from peanut extracts Chung, Si-Yin

26391 Bacterial exopolysaccharides for corrosion inhibition on metal substrates Finkenstadt, Victoria

26972 Total synthesis of 3-hydroxymedicarpin Luniwal, Amarjit

23923 Heavy metal concentrations in baby formula purchased from U.S. supermarkets Clark, Brandi

26414 Microwave induced de-emulsification of biocolloids Mitra, Somenath

26917 One pot esterification-silylation of hydroxy fatty acids: The role of amines as catalysts and scavengers Canela, Ramon

26471 Inhibition of cartilage collagen breakdown by dietary polyphenols Seeram, Navindra

26522 Effect of Shiitake mushroom extract on growth of lactic acid bacteria and bifidobacteria Hassan, Osman

26541 Comparison of toxicological properties of botulinum neurotoxin serotypes A and B in mice Cheng, Luisa

26890 St. John's wort significantly inhibited the elimination of indoxyl sulfate, an uremic toxin, in rats Yang, Shih-Ying

26895 Effect of Folium Sennae on methotrexate pharmacokinetics in rats Peng, Yu-Hsuan

24364 Study of the photostability of THSG under light and temperature at equal pace Xiao-liang, Ren

27246 Development of analytical method and survey of foods for furan, 2-methylfuran and 3-methylfuran with estimated exposure Becalski, A.

14247 Effects of low-intensity microwave radiation on *Tribolium castaneum* physiological and biochemical characteristics and survival S.M, Zhao

11755 Study on microencapsulation of goose fat liver with considerable amounts of lecithin Sun, Jing-xin

**26562 Incidence and level of *Listeria monocytogenes* and other *Listeria* spp. in ready to eat meat products in Jordan** 1. Mu'tah University, Department of Food Science, Karak, Jordan 2. North Carolina Agricultural and Technical State University, Department of Family and Consumer Science, Greensboro, NC, 1. Saddam S Awaisheh1 , Saddam\_awaitshah@yahoo.com 2. Salam A Ibrahim2 , North Carolina ATState University, Department of Family and Consumer Science, Greensboro, NC, ibrah001@ncat.edu *Listeria monocytogenes* is one of the most virulent foodborne pathogens. In order to provide information to Jordanian health authorities on the incidence of *L. monocytogenes* in ready-to-eat-meat-products (RTE-MPs) sold and consumed in Jordan, and to ascertain the risks of these products for consumers, this study aimed to investigate the incidence and contamination levels of different *L. monocytogenes* serovars in RTE-MPs collected from different outlets and processing plants in Jordan and to compare the accuracy and sensitivity of EN ISO and USDA protocols in isolation and presumptive identification of *L. monocytogenes*. *L. monocytogenes*, *L. innocua*, and *L. welshimeri* were isolated from 41, 56, and 36 samples, respectively out of 240 RTE-MPs samples (120 beef and 120 poultry). The incidence of *L. monocytogenes* was confirmed using PCR. The EN ISO protocol was more accurate and sensitive in isolating *L. monocytogenes* than was the USDA protocol (100% vs 73%) in positive samples. Contamination levels of *L. monocytogenes* were found to be  $\geq 100$  CFU/g in 40 samples out of 41 positive samples. Only one beef sample with count was above 100 CFU/g. *L. monocytogenes* strains isolated fell into 2 serotypes, 1 and 4, and into 4 different serovars, 1/2a, 1/2b, 1/2c, and 4b. Our study concluded that strict hygienic and processing standards should be applied in meat processing factories in order to control and eliminate the incidence of *Listeria* spp. in RTE-MPs in Jordan.

**26536 Antimicrobial effect of copper alone or in combination with lactic acid on growth of *Escherichia coli* O157:H7 in laboratory media and on the surface of lettuce and tomatoes** 1. North Carolina Agricultural and Technical State U., Dept of Family and Consumer Science, Greensboro, NC, 2. Mu'tah Univ, Department of Food Science, Karak, Jordan 1. Rabin Gyawali1 rgyawali@gmail.com 2. Danfeng Song1 , danfeng.song@gmail.com 3. Salam Ibrahim1 ibrah001@ncat.edu 4. Saddam S Awaisheh2 , Saddam\_awaitshah@yahoo.com Food safety issues and outbreaks of food-borne illness caused by *E. coli* O157:H7 in produce have raised concerns among consumers. Consumers' demand for natural ingredients to control such pathogens is drawing attention to the food industry considering better alternatives. The objective of this study was to evaluate antimicrobial effects by copper alone or in combination with lactic acid on growth of *E. coli* O157:H7. The concentrations of copper ions 5, 10, 20, and 40 ppm and lactic acid 0.1%, 0.2% and 0.25% were tested on four strains of *E. coli* O157:H7 (H1730, 86.24, 43895-, and 43895+). The inhibitory effect was measured by optical density at different time intervals. Copper ions at all concentrations and 0.1% lactic acid had no inhibitory effect. However, lactic acid higher than 0.2% significantly retarded the bacterial growth. Combination of 20 ppm copper and 0.2% lactic acid showed significant growth inhibition ( $p < 0.05$ ) compared to individual treatment

and the control sample. Results indicated that there is a synergistic effect of copper ion and lactic acid on the growth inhibition of *E. coli* O157:H7 and therefore could be used as the natural ingredients to improve the safety on fresh produce.

**26541 Comparison of toxicological properties of botulinum neurotoxin serotypes A and B in mice** 1. U.S. Department of Agriculture, Agricultural Research Service, Albany, CA, 1. Luisa W Cheng1, USDA, Foodborne Contaminants Research Unit, Albany, CA luisa.cheng@ars.usda.gov 2. Thomas D Henderson1, 3. Miles C Scotcher1, 4. Larry H Stanker1, Botulinum neurotoxins (BoNTs) are among the most toxic biological toxins for humans. Of the seven known serotypes (A-G) of BoNT, serotypes A, B and E cause most of the human foodborne intoxications. In this study, we compared the toxicological properties of BoNT serotype A and B holotoxins and complexes using the mouse systemic and oral models of botulism. The kinetics of dosage response and the effects of various food matrices on the oral bioavailability of BoNT/A and B were determined. Several factors, such as the presence of neurotoxin-associated proteins, the size of the toxin complex, or the type of food matrix, can either positively or negatively impact the oral bioavailability of BoNTs. Serotypes A and B toxin complexes are also absorbed at different rates in the oral mouse model. Understanding of the complexities of BoNTs will aid in food risk assessments as well as the design of novel therapeutics.

**18851 Quantitative UPLC-MS/MS method for the determination of native 5-methyl-tetrahydrofolate and polyglutamyl derivatives in raw vegetables and vegetable juice** 1. The Ohio State University, Department of Food Science and Technology, Columbus, OH, 1. Chao Wang1, wang.1244@osu.edu 2. Ken M. Riedl1 Steven J. Schwartz1 Many vegetables are excellent folate sources occurring as polyglutamyl 5-methyltetrahydrofolate (5MTHF). Quantitative determination of the intact folate is difficult due to lengthy extraction and clean-up procedures as well as limited detection sensitivity. Here we report a rapid extraction and UPLC-MS/MS method for the determination of folate in vegetables and vegetable juice. Samples (14 different vegetable species from Brassicaceae, Asteraceae, Amaranthaceae and Apiaceae families) were extracted in boiling reducing buffer with 13C5-5MTHF added as internal standard. The folate species were separated by reversed phase UPLC in 9 min and eluate was interfaced with a triple quadrupole mass spectrometer operated in positive electrospray mode. The respective pseudo-molecular cation of each 5MTHF species was fragmented for selective MS/MS detection. 5MTHF polyglutamyls predominated in vegetables but during juicing converted to monoglutamyl 5MTHF and degraded enzymatically. Pre-steaming of the vegetables preserved folate and various polyglutamyl folate profiles and could be achieved by combining specific vegetable juices.

**26657 Use of natural antioxidants to prevent the degradation of oils and formation of toxic reactive aldehyde products** 1. College of Saint Mary, Chemistry, Omaha, NE, 1. Jami L Mitchell1, College of Saint Mary, Chemistry, Omaha, NE, jwilwerding40@csm.edu The objective of this research was to prevent the degradation of oils during the frying process. The oils undergo a lipid peroxidation process during frying and oxidation in the oil can be inhibited by addition of antioxidants. We are testing the use of natural antioxidants to prevent the degradation of oils and formation of toxic reactive aldehyde products, such as 4-hydroxynonenal and malonaldehyde. These aldehydes are the carbonyl compounds that are formed by the decomposition of hydroperoxides. The research provided data on lipid peroxidation levels in French fries prepared in different cooking oils. The degradation of oils can be monitored by p-anisidine values assay which can be done by using a spectrophotometer. This method is approved by American Oil Chemists' Society (AOCS-cd18-90). Furthermore, HPLC analysis was also used for quantitative analysis of lipid peroxidation products formed during degradation of the oils.

**26706 Solid-liquid extraction of biomass feedstocks grown under saline irrigation** 1. University of California, Davis, Biological and Agricultural Engineering, Davis, CA 1. Chaowei ycywu@ucdavis.edu 2. Jaclyn DeMartini1, jddemartini@gmail.com 3. Jean S. VanderGheynst1 jsvander@ucdavis.edu 4. Bryan M. Jenkins1, bmjenkins@ucdavis.edu Two potential biomass crops, Athel (*Tamarix aphylla*) and Jose tall wheatgrass (*Agropyron elongatum*, JTWG), have been tested for their use in phytoremediation of salinized soils in the west side of the San Joaquin Valley, California. Grown under saline irrigation, these plants are high in alkali metals (K and Na) and chlorine which promote ash slagging and fouling as well as corrosion in high temperature systems. Leaching was studied for its application in extracting inorganic compounds in order to improve the thermal properties of these plants. Samples were leached in water at various temperatures and solid-liquid ratios, and for different times. Leaching removed up to 84% and 72% of the ash in Athel and JTWG, respectively after 2 hours of leaching. Also, leaching removed around 93%, 80%, and 94% of Na, K, and Cl from both feedstocks after 15 minutes. Reducing the concentration of these constituents through leaching constitutes a significant improvement in saline feedstock quality for thermal applications.

**26863 Discovery of a new class of 3'-phosphoadenosine-5'-phosphosulfate reductase from the methanarcheon Methanocaldococcus jannaschii** 1. Baylor University, Chemistry and Biochemistry, Waco, TX 1. Jong-Sun Lee1, Sun\_Lee1@baylor.edu Methanocaldococcus jannaschii is a deeply-rooted hyperthermophilic, hydrogenotrophic methanarchaeon that resides near a deep-sea hydrothermal vent. An analysis of the fully revealed *M. jannaschii* genome sequence suggests the possible presence of a sulfate reduction pathway in this organism. To explore the sulfate reduction pathway, we attempted to express the open reading frame (ORF) MJ0066 in the genome of *M. jannaschii*. The gene was cloned with six histidines as a tag at the N-terminus and the recombinant gene was expressed using *E. coli*. After successful purification for the gene product, the protein was found to reduce 3'-phosphoadenosine-5'-phosphosulfate (PAPS) as a substrate with *E. coli* thioredoxin (Trx) supplied as the electron donor. The apparent  $K_m$ , for substrate PAPS, and  $V_{max}$  values were  $9.0\mu M$  and  $0.14\mu Mmg^{-1}min^{-1}$ , respectively, at pH 8.0 and 30 °C. The catalytic efficiency with PAPS as the substrate was found to be  $1.58 \times 10^{-9} M^{-1}s^{-1}$ . The protein-ligand docking program AutoDock 4.0 predicted Cys337 as the possible catalytic site of the protein to the ligand (i.e., PAPS). Evidence of PAPS reductase activity strongly suggests the presence of a PAPS-utilizing sulfate reduction pathway in methanarcheon methanocaldococcus jannaschii, which contributes to a growing understanding of evolution in Earth's organisms. 26890 St. John's wort significantly inhibited the elimination of indoxyl sulfate, an uremic toxin, in rats 1. China Medical University, Graduate Institute of Pharmaceutical Chemistry, Taichung, Taiwan, 40402, Taiwan Republic of China 2. China Medical University, School of Pharmacy, Taichung, Taiwan, 40402, Taiwan Republic of China 1. Shih-Ying Yang1, China Medical University, Graduate Institute of Pharmaceutical Chemistry, No.91 Hsueh-Shih Road, Taichung, Taiwan, 40402, Taiwan Republic of China, yangshihshih@gmail.com 2. Yu-Chi Hou2 3. Pei-Dawn Lee Chao2 Indoxyl sulfate (IS), an uremic toxin, accumulates in uremia patients and can not be removed by dialysis. The transport of IS is associated with organic anion transporter (OAT). St. John's wort (SJW), a popular herbal remedy for treating depression,

contains abundant polyphenols including hypericin, quercetin and rutin. Polyphenols have been found to be metabolized in vivo into sulfates and glucuronides, which may compete with IS for transport by OAT. This study investigated the effect of SJW intake on the elimination of IS. Rats were intravenously injected IS with and without SJW. Blood was drawn at specific times and IS concentration in serum was assayed by LC/MS. The results showed that IS serum concentrations were significantly increased by SJW at high IS level, moreover, serious hemolysis was observed. In conclusion, SJW significantly decreased the elimination of IS at high serum level, an indication that SJW may be harmful to uremia patients

**26895 Effect of Folium Sennae on methotrexate pharmacokinetics in rats** 1. China Medical U., school of pharmacy, Taichung, Taiwan, Taiwan Republic of China 1. Yu-Hsuan Peng1, yspeng7293@yahoo.com.tw 2. Yu-Chi Hou1 3. Shang-Yuan Tsai1 4. Pei-Dawn Lee Chao1 Folium Sennae (leaves of *Cassia angustifolia*), a potent laxative, contains abundant anthraquinone polyphenols. Methotrexate (MTX) is a bicarboxylate immunosuppressant with a narrow therapeutic window. The transport of MTX was associated with multidrug resistance-associated protein (MRPs) and organic anion transporter (OATs). Judging by the finding that anthraquinones were present as glucuronides and sulfates, probable substrates of MRPs and OATs, in the circulation, the serum metabolites of Folium Sennae decoction (FSD) may compete with MTX for transporters. Our study investigated the effect of FSD on MTX pharmacokinetics. Rats were orally administered MTX with and without FSD. Blood was drawn at pre-determined time points and MTX serum concentrations were assayed by FPIA method. Our results showed that FSD significantly decreased the AUC<sub>0-120</sub> of MTX, whereas the AUC<sub>120-2880</sub> and MRT were significantly increased. In conclusion, the concurrent use of FSD with MTX should be avoided to ensure the efficacy and safety of MTX.

**26901: Crude glycerol and raw and waste acylglycerides as starting materials to prepare chlorohydrin and allyl esters with industrial applications** 1. Universitat de Lleida, Department of Chemistry, Lleida, Catalonia, Spain 2. Universitat de Lleida, Department of Crop and Forest Sciences, Lleida, Catalonia, Spain 3. Universitat de Vic, Department of Environment and Food, Vic, Catalonia, Spain 4. Universidad del Tolima, Department of Chemistry, Ibaguè, Tolima, 546, Colombia 1. Jordi Eras1 , eras@quimica.udl.cat 2. Marc Escribà1 , Spain 3. Marta Giné1 , Spain 4. Mercè Balcells1 , Spain 5. Jesus Avilla2 , Spain 6. Jonh Jairo Mendez4 , 7. Consol Blanch3 , 8. Núria Barniol3 , 9. Ramon Canela1 , We present how glycerol and fats or oily rich wastes from agro-food industry, can be used to prepare useful products. Glycerol from a biodiesel plant (90 w/w) and several fats and fatty wastes (80 and 96% w/w of triacylglycerides) were used in a process based on a simultaneous esterification-chlorination reaction using different chlorine sources and heating systems. Depending on the heating system the main product formed was the 2-chloro-1-chloromethylethyl carboxylate or a mixture of the 2-chloro-1-chloromethylethyl and 2,3-dichloropropyl carboxylates. The final yields depended on the richness of the oily materials and the glycerol. We have used these mixtures to prepare allyl esters using sodium iodide and n-butanol as solvent. The reaction can be conducted by using either conventional or microwave heating. The conversion and yields depended, as indicated above, on the richness of the starting materials. Ovicidal, and larvicidal activity of the allyl esters on some crop pests is also presented.

**26917 One pot esterification-silylation of hydroxy fatty acids: The role of amines as catalysts and scavengers** 1. Universitat de Lleida, Department of Chemistry, Lleida, Catalonia, Spain 2. Universidad del Tolima, Department of Chemistry, Ibaguè, Tolima, Colombia 3. Universitat de Lleida, Department of Food Science and Technology, Lleida, Catalonia,, Spain 1. Jordi Eras1 eras@quimica.udl.cat 2. Olalla Novo1 , 3. Gemma Villorbinal 1 , 4. Jonh Jairo Méndez2 , 5. Mercè Torres3 , 6. Núria Sala3 , 7. Mercè Balcells1 , 8. Ramon Canela1 , canela@quimica.udl.cat The interest in hydroxy fatty acids has increased for their applications in resin, cosmetic, fragrances and pharmacy industries. Its presence is used in medical diagnosis of fatty acid oxidation disorders. Hydroxy fatty acids are present in plants and animals species and can be obtained from diverse vegetable sources such as castor oil (from *Ricinus communis*) or cork suberin. Samples contain different fatty acids and the characterization of hydroxy fatty acids is carried out by gas chromatography. After methylation of the carboxyl group, the hydroxyl group is silylated. We present a new one pot method to carry out this process. The derivatization method is based on using accurate molar ratios of methanol, chlorotrimethylsilane and an amine. We have tested triethylamine, hexamethyldisilazane, imidazole and N-butylimidazole. The efficiency of derivatization depends of the amine used. The best results were obtained when imidazole was used

**27246 Development of analytical method and survey of foods for furan, 2-methylfuran and 3-methylfuran with estimated exposure** 1. Health Products and Food Branch, Health Canada, Food Research Division, Bureau of Chemical Safety, Ottawa, Ontario, Canada 1. A. Canada , Adam\_Becalski@hc-sc.gc.ca 2. S. Hayward2 , 3. T. Krakalovich3 , 4. L. Pelletier4 , 5. V. Roscoe3 , 6. E. Vavasour5 , Methyl analogs of furan, 2-methylfuran and 3-methylfuran, were analysed concurrently with furan via a newly developed isotope dilution method, as these analogs were detected in foods in our earlier work and are likely to undergo a similar metabolic fate as furan itself. We are reporting data on 176 samples from the Canadian market including 17 samples of baby food. The vast majority of samples were packaged in cans or jars. Furan was detected above 1 ng/g in all non-baby food samples with a median of 28 ng/g, and concentrations ranging from 1.1 ng/g to 1230 ng/g. Also, 96% of these samples were found to contain 2-methylfuran above 1 ng/g with a median of 12.8 ng/g, and a maximum concentration of 152 ng/g, while 81% of samples were found to contain 3-methylfuran above 1 ng/g with a median of 6 ng/g, and a maximum concentration of 151 ng/g. Similarly, furan was detected above 1 ng/g in all baby food samples with a median of 66.2 ng/g, and concentrations ranging from 8.5 ng/g to 331 ng/g. Also, 100 % of these samples also were found to contain 2-methylfuran above 1 ng/g with a median of 8.7 ng/g, and a maximum concentration of 50.2 ng/g, while 65% of samples were found to contain 3-methylfuran above 1 ng/g with a median of 1.6 ng/g, and a maximum concentration of 22.9 ng/g. Additionally, three coffee samples were analysed "as is", without brewing, and were found to have high levels of furans, especially 2-methylfuran, at a maximum of 8680 ng/g. Using this dataset, dietary exposures to furan and total furans were calculated. Average furan and total furan intakes by adults (> 20 years) were estimated at approximately 0.37 and 0.71 µg/kg of body weight/day respectively.

**26972 Total synthesis of 3-hydroxymedicarpin** 1. The University of Toledo, College of Pharmacy, Department of Medicinal and Biological Chemistry, Toledo, Ohio. Amarjit Luniwal1 , Amarjit.Amarjit@rockets.utoledo.edu 2. Paul W. Erhardt1 , Because of their antioxidant properties, isoflavonoids remain of interest for the treatment of disorders where free radicals can play a role such as cancer, Alzheimer's, Parkinson's, and certain cardiovascular diseases (1). 3-Hydroxymedicarpin, a pterocarpan, was first reported from the *Trifolium pratense* infected *Melilotus alba* (2). A recent study has found that it constitutes the aglycone part of the biologically active licoagroside E

obtained from hairy root cultures of *Glycyrrhiza pallidiflora* (3). Several reports have attributed biological activities such as antimicrobial, antioxidant, and antiviral etc. to phenolic constituents in *Glycyrrhiza* species (4). Because of the therapeutic potential of isoflavonoids as cancer preventive agents, our lab has undertaken a multi-step total synthesis of 3-hydroxymedicarpin to produce it in quantities large enough for testing in various cancer cell lines. An intramolecular Wittig reaction and a Sharpless dihydroxylation are the two key steps of the synthetic strategy which efficiently provided the intermediate molecules in good yields. The final quinone- methide-mediated benzofuran ring formation step (5,6) produced 3- hydroxymedicarpin in ca 15% overall yield after eight steps.

**26194 Measurement of some physical and chemical properties of reconstituted skim milk powder at high temperatures using dialysis membranes**

1. University of Reading, Department of Food and Nutritional Sciences, Reading, Berkshire, United Kingdom 1. Roussa Tsikritzi1, afr06rt@rdg.ac.uk 2. Alistair S Grandison1 3. Michael J Lewis1 This study investigated the role of pH and Ca<sup>2+</sup> on the heat stability of skim milk powder, which was reconstituted up to 9%, 15%, 20% and 25% total solids. Dialysis was used to measure properties of the soluble phase of milk at 20°C and at high temperatures (80°C, 90°C, 100°C, and 115°C). Dialysis membranes were of two types of molecular weight cut-off (MWCO): 12-14 kDa and 250 kDa. The use of larger MWCO entailed an increase in pH and freezing point depression (FPD) of dialysates whereas Ca<sup>2+</sup> concentration decreased. As temperature rose, all components decreased with pH reaching almost 6.0 and Ca<sup>2+</sup> falling 4 times at 115°C. The increase in total solids caused a decrease in pH and an increase in Ca<sup>2+</sup> and FPD. For pH, equilibrium was reached at 90°C, while Ca<sup>2+</sup> concentration equilibrated at 100°C. Dialysis provided a means of measuring Ca<sup>2+</sup>, pH and other soluble minerals at the temperatures where heat coagulation occurs.

**26218 Simple two-phase solvent system preparation of tectoridin from *Puerariae flos***

1. Huazhong Agriculture University, College of Food Science and Technology, Wuhan, Hubei, China 2. South Central University for Nationalities, College of Life Science, Wuhan, Hubei, China 3. North Carolina ATState University, Department of Family and Consumer Sciences, Greensboro, NC 1. Wen Huang1 , Dr, Huazhong Agriculture University, College of Food Science and Technology, Wuhan, Hubei, China , huangwen@mail.hzau.edu.cn 2. Gang Cheng2 , South Central University for Nationalities, College of Life Science, Wuhan, Hubei, China , cheng\_gang28@yahoo.com.cn 3. Yongdan Zhang1 , 4. Ting Han1 , 5. Hong Yang1 , 6. Salam A Ibrahim3 , , ibrah001@ncat.edu The objectives of this study were to determine the ability of new n-butanol/water two-phase solvent system to extract isoflavones from *Puerariae lobata* and to determine their antioxidant properties. The optimal conditions for isoflavones extraction were determined by response surface methodology. Results indicated that the optimal conditions to obtain the highest yield of isoflavones were n-butanol/water composition of 1:1 (v/v) and solvent-solid ratio of 55:1 at 70 °C for 1.30 h. The extraction yield of total isoflavones was up to 96.24% and the purity of isoflavones sample was about 73.89%. There was only one compound from the n-butanol site, tectoridin, based on the spectra of HPLC-MS/MS, 1H NMR, and 13C NMR. The extracted materials were found to be effective antioxidant as scavengers of superoxide and hydroxyl radicals. Results suggested that the two-phase solvent system is a rapid and simple, resulting in the higher yields of tectoridin from *Pueraria lobata*, compared to the traditional single-phase extracting methods.

**26245 Fructans and age relationship in *Agave tequilana* Weber var. azul**

1. CINVESTAV-IPN, Department of Biotechnology and Biochemistry, Irapuato, Guanajuato, Mexico 1. Mellado-Mojica Erika1 , emellado@ira.cinvestav.mx 2. López Mercedes G.1 , Abstract Body: *Agave tequilana* Weber var. azul is an economically important plant in Mexico because it is the only raw material allowed for tequila production. Fructans are functional supplements due to their prebiotic effect. *A. tequilana* from 2 to 7 year old plants were analyzed. By TLC and HPAEC-PAD fructan profiles were determined and fructan contents were measured by enzymatic assay. HPAEC-PAD chromatograms of *Agave* fructans showed differences in abundance and fructan type in all *Agave* ages. The highest (>60% DM) and the lowest (<60% DM) fructan contents were found in 5-7 and 2-4 year old plants respectively. Short degree polymerization (SDP) fructans were more abundant in 2-4 year old plants and 5-7 year old plants stored large degree polymerization (LDP) fructans principally. The molecular structures of *A. tequilana* fructans were different in each age. Therefore, since *A. tequilana* synthesized different fructans at different ages they might be useful in several food industrial applications without enzymatic or thermal hydrolysis after their extraction

**26252 Fructan metabolism in *Agave tequilana* Weber var. azul during its productive life cycle**

1. CINVESTAV-IPN, Department of Biotechnology and Biochemistry, Irapuato, Guanajuato,, Mexico 1. Mellado-Mojica Erika1, emellado@ira.cinvestav.mx 2. López Mercedes G.1 , *Agave tequilana* Weber var. azul belongs to CAM plants, graminans and branched neofructans (agavins) are its principal storage carbohydrates. *Agave* fructans are a mixture of  $\alpha(2-1)$  and  $\alpha(2-6)$  linkages, but it also contains branches moieties, therefore several fructosyltransferases (FTF's) must be implicated in their metabolism. Vacuoles were isolated from *A. tequilana* from 2 to 7 year old plants (productive life cycle). SDS-PAGE showed proteins with similar FTF's molecular weight (50kDa and 25kDa). The activity of several fructosyltransferases in the vacuolar protein extracts were demonstrated through enzymatic assays, the products were determined by TLC and HPAEC-PAD. Kestose was the principal product with sucrose as substrate. Neokestose and several DP3 isomers were preferentially synthesized over nystose and DP5 with kestose as substrate. Products synthesized correspond to 1-SST, 1-FFT and 6G-FFT activities. Fructose released using *Agave* fructans as substrate confirmed the presence of FEH, a hydrolase FTF. SDS-PAGE-2D showed differential expression in some proteins according to plant age. Finally, since *Agave* fructans were found in vacuolar extracts, it could be said that the vacuole is the cell organelle for fructans metabolism in *Agave tequilana* Weber var. azul.

**26131 IgY Celiac study: Antigliadin specific IgY formulation and its functional property in simulated gut environment**

1. Univ. of Alberta, Faculty of Pharmacy and Pharmaceutical Sci., Edmonton,, Canada 1. Naiyana Gujral1, ngujral@pharmacy.ualberta.ca 2. Hoon H Sunwoo1 , hsunwoo@ualberta.ca 3. Mavanur R Suresh1 , msuresh@pharmacy.ualberta.ca The present study evaluates the survival rate of the specific IgY formulation (coated with mannitol) against  $\alpha$ -,  $\beta$ -,  $\gamma$ -gliadin fractions in simulated gastric fluid (SGF, pH 1.2) and simulated intestinal fluid (SIF, pH 6.8). According to USP dissolution test, the survival of IgY formulation was 80% in 2 hours SGF exposure. Whereas IgY formulation was highly degraded and its survival rate was 5.57% in 1 hour and 2.85% in 2 hours SIF exposure. A competitive ELISA shows that 0.08 gram of IgY formulation captured 0.4 gram of gliadin in SGF at 50% inhibition. The ELISA of gliadin spiked in 10 gram of food shows that 0.08 gram of IgY formulation captured 0.6 gram of gliadin in food at 50% inhibition in SGF. In SIF condition, 0.08 gram of IgY formulation captured 0.03 gram of gliadin, but with food IgY formulation captured 0.45 gram of gliadin at 50% inhibition.

**26156 Optimization of an enzyme-linked immunosorbent assay and sample clean-up for the analysis of 17 $\beta$ -estradiol in poultry litter** 1. University at Buffalo, Department of Chemistry, 2. BAM Federal Institute for Materials Research and Testing, Germany 1. Stacia Wegst1 , srwegst@buffalo.edu 2. Diana Aga1 3. Rudolf Schneider2 , The occurrence of hormones in the environment has raised great concern in the scientific and mainstream media because of their endocrine disrupting properties at low (ng/L) levels. Quantification of hormones in environmental samples is challenging because of their strong sorptive nature, requiring harsh extraction conditions for sample analysis. Extracts contain complex matrix that interferes with detection of hormones at low levels. The use of enzyme-linked immunosorbent assay (ELISA) to determine estrogenic hormones provides for a fast, cost-effective screening of samples. Matrix effects may be encountered causing of false positives; therefore, minor sample clean-up is necessary to optimize the performance of ELISA. This study optimized an accelerated solvent extraction, solid-phase extraction, and ELISA method for the trace analysis of 17 $\beta$ -estradiol in poultry litter samples. The study aims to provide an effective screening tool to be used in a watershed-scale study on the fate and transport of 17 $\beta$ -estradiol in croplands using raw and treated poultry litter. The ELISA results correlated well with liquid-chromatography/mass spectrometry analysis.

**26157 Study of the effect of different physical treatments on the formation of bovine alpha-lactalbumin nanoparticles by the desolvation method** 1. Escuela Nacional de Ciencias Biologicas Departamento de Graduados e Investigacion en Alimentos, Mexico, 2. Escuela Nacional de Ciencias Biologicas Central de Microscopia, Mexico, 3. Centro de Ciencias Aplicadas y Desarrollo Tecnologico - Lab. Ciencias Aplicadas y Nanotecnologia, Mexico, 1. Izlia J. Arroyo-Maya1 , izlia27@yahoo.com.mx 2. Veronica Velasco1 3. Maria Esther Sanchez-Espindola2 , 4. Jose Ocotlan Flores-Flores3 , 5. Gustavo F. Gutierrez-Lopez1 6. Humberto Hernandez-Sanchez1 Bovine alpha-lactalbumin ( $\alpha$ -LA) nanoparticles were obtained by the desolvation process using three different solvents (acetone, isopropanol and ethanol) and two physical treatments: High Hydrostatic Pressure (600 MPa) and heat (60°C/30 min). Following the desolvation of the protein the resulting nanoparticles were stabilized by the addition of glutaraldehyde and a morphological characterization was performed. Particle size was measured by dynamic light scattering and the results indicated that size and shape depended mainly on the kind of solvent used and in most cases on the heat treatment but not on the HHP treatment. Ethanol showed the best performance, producing regular particles with a diameter between 200 and 275 nm and a predictable behavior with diameter increasing with the rigorosity of the treatment. Fractal dimension decreased from 1.84 to 1.57 with the severity of the treatment and circularity remained constant for all treatments.

**25689 IgY Based double antibody sandwich ELISA for the detection of gliadin in foods** 1. U. of Alberta, Faculty of Pharmacy and Pharmaceutical Sci, Edmonton, Canada 1. Hoon H Sunwoo1, hsunwoo@ualberta.ca 2. Naiyana Gujral1 , ngujral@pharmacy.ualberta.ca 3. Youn H Nam1, ynam@ualberta.ca 4. Mavanur R Suresh1 , msuresh@pharmacy.ualberta.ca Current Codex guidelines recommend avoiding foods containing more than 0.03% wheat protein, which equates to about 100-200 parts per million gluten. The objective of this study is to develop more sensitive and inexpensive detection assay of gliadin in foods, we tested a double-antibody sandwich ELISA (D-ELISA) with MAb (HYB314) as the capture antibody and biotinylated IgY as the detecting antibody. In the present study, the D-ELISA showed the detection limit of 1.5 ng/ml of standard gliadin. The validity of the D-ELISA for gliadin was examined further by precision testing. The intra-assay coefficient of variation, determined by replicate measurements (n=10) of serially diluted gliadin on a microtiter plate, was 9.2%. The inter-assay coefficient of variation, determined by 5 independent measurements of gliadin, was 9.8%. The control, without adding gliadin, showed no color in all the assays. The biotinylated IgY for the detection of gliadin was economically produced.

**26091 Capture and detection of natural populations of E. coli from freshwater using immune-magnetic nanoparticles** 1. U. of Idaho, Biosensor and Nanotechnology Applications Laboratory Coeur D'Alene, ID, 1. Shiva K Rastogi1, srastogi@uidaho.edu 2. CharLene M Gibson1 , gibsonc@uidaho.edu 3. David A Newcombe1 , dnewcomb@uidaho.edu 4. A. Larry Branen1 , lbranen@uidaho.edu The magnetic nano-particles (NPs) were prepared by encapsulation of iron oxide NPs with silica dioxide using the sol-gel method and characterized through transmission electron microscopic imaging, Fourier transform infrared spectroscopy and magnetic hysteresis. Silica encapsulated magnetic NPs were chemically treated with cyanogens bromide or  $\gamma$ -glycidoxy-propyltrimethoxysilane and then functionalized with specific antibodies or carbohydrate moiety. The functionalized NPs were used to capture and concentrate the natural Escherichia Coli (E. coli) from several local environmentally impacted water streams. Capture of the bacterial by the magnetic NPs was confirmed using UV-Visible spectroscopy, plating on nutrient agar and through use of fluorescent detection using secondary polyclonal antibody labeled with peroxidase. Captured E. coli was also detected using electrochemical detection based on a magneto-electrode on screen printed carbon electrode strip. The number of immuno-magnetic NPs proved to be an effective method for capture of a verity of an E. coli found in water stream. This method may ultimately be of use as a rapid monitoring procedure for water quality. PrePrint: No response indicated

**26039 Agave fructans prevent bone loss by stimulating bone formation** 1. CINVESTAV-IPN, Department of Biotechnology and Biochemistry, Irapuato, Guanajuato, Mexico 1. María Isabel García-Vieyra1 migarcia@ira.cinvestav.mx 2. Mercedes G. López1 , mlopez@ira.cinvestav.mx Fructans are non-digestible carbohydrates, they have been considered as functional components due to their positive effects increasing calcium absorption and deposition in bones. We evaluated two different commercial Agave fructans (A and B) on bone mineralization. Forty eight ovariectomized mice were fed with standard or supplemented diets with 10% Agave fructans or 10% inulin fructans (positive control). Calcium in plasma and bone (femur), calcium excretion in feces, and osteocalcin levels (bone marker formation) were evaluated. Calcium in plasma and bone increased in both Agave fructans groups (53.1 to 56-85 mg/mL and 0.402 to 0.474-0.478 g/g bone respectively). Calcium excretion in feces decreased in all fructans groups but was not statistically significant. Osteocalcin levels increased in all fructans groups (>50%). These results suggest that the supplementation of the standard diet with Agave fructans prevented bone loss and improved bone formation; indicating the important role of Agave fructans on the maintenance of healthy bones.

**25849 Production of capsaicin-loaded nanoparticles for functional food delivery system by microfluidization** 1. Korea Food Research Institute, Bio-Nano Research Center, Seongnam, Kyeoggido, Republic of Korea 1. Chong-Tai Kim1, ctkim@kfri.re.kr 2. Chul-Jin Kim1, Republic of Korea, chjkim@kfri.re.kr 3. Yong-Jin Cho1 , yjcho@kfri.re.kr 4. Min-Ji Kim1 Lipophilic bioactives from natural sources, including phytoosterols, antimicrobial, antioxidants, w-3 fatty acids, flavonoids, and numerous other components, are widely utilized as functional ingredients in food industry. However, most of above those bioactives are almost insoluble in water and unstable at a specific

environmental stimulus such as light, oxygen, and temperature during manufacture, storage, transport, and utilization. Food nanomaterials can offer several advantages over traditional food delivery systems for nutraceuticals or functional ingredients, which include protection of bioactives, an increase in its solubility, stability and bioavailability. Nanomaterials, such as nanoparticle, nanoemulsion, nanocomposites and nanostructured materials generally may be prepared by using nanotechnology, including nanoemulsification, association colloid and nanostructured multiple or multilayer emulsification. Nanoparticles including nanoemulsion and nanostructured liquid can be produced by low-energy emulsification or self-assembly emulsification. However, in most cases, nanoemulsions can be produced using a high-energy input such as high-pressure homogenation, ultrasonication and microfluidization, which lead to a better control of the droplet size and a large choice of compositions. This research investigated the production of capsaicin-loaded nanoemulsions (CLN) of oil-in-water type by microfluidization. Process parameters such as microfluidization pressure, cycles and emulsion composition were adapted to determine the optimum condition for CLN production.

**25804 Topical anti-inflammatory agents from *Artemisia umbelliformis* Lam., an edible alpine flavoring plant** 1. Università di Trieste, Dipartimento dei Materiali e Risorse Naturali, Trieste, Italy 2. Università di Trieste, Dipartimento Universitario Clinico di Biomedicina, Trieste, Italy 3. Università del Piemonte Orientale, Dipartimento di Scienze Chimiche, Alimentari, Farmaceutiche e Farmacologiche, Novara, Italy 4. Università di Napoli Federico II, Dipartimento di Chimica delle Sostanze Naturali, Napoli, Italy 1. Anna Giangaspero<sup>1</sup>, 2. Silvio Sosa<sup>1</sup>, 3. Cristina Ponti<sup>2</sup>, 4. Giorgia Del Favero<sup>1</sup>, 5. Federica Pollastro<sup>3</sup> 6. Cristina Avonto<sup>3</sup>, 7. Orazio Tagliatela-Scafati<sup>4</sup>, 8. Roberto Della Loggia<sup>1</sup>, 9. Giovanni Appendino<sup>3</sup>, 10. Aurelia Tubaro<sup>1</sup>, Prof., University of Trieste, Dep. of Materials and Natural Resources, Via Valerio 6, Trieste, Italy tubaro@units.it *Artemisia umbelliformis* Lam. (Asteraceae) is an alpine plant used to produce the bitter liqueur genepy. The lipophilic flavonoid eupatilin and a series of sesquiterpenes lactones isolated from this plant were studied for their topical anti-inflammatory activity (inhibition of the Croton oil-induced mouse ear dermatitis) in comparison to the steroidal and non steroidal drugs, hydrocortisone and indomethacin. Six hours after dermatitis induction, the anti-oedema potency of eupatilin was comparable to that of indomethacin (ID<sub>50</sub> = 0.30 and 0.26 μmol/cm<sup>2</sup>), and slightly higher than that of genepolide, santamarin, deoxy-5-hydroperoxy-telekin, deoxy-5-hydroperoxy-epitelekin and costunolide (ID<sub>50</sub> ranged from 0.40 to 0.73 μmol/cm<sup>2</sup>). The overall effect of eupatilin on oedema and granulocyte infiltration up to 48h was intermediate between that of indomethacin and hydrocortisone, but its activity profile was similar to the latter. Further studies are in progress to evaluate the molecular targets and possible synergistic interactions between the two classes of anti-inflammatory agents from genepy.

**26414 Microwave induced de-emulsification of biocolloids** 1. New Jersey Institute of Technology, Department of Chemistry & Environmental Science, 1. Somenath Mitra<sup>1</sup>, Somenath.Mitra@njit.edu 2. Smruti Rangunath<sup>1</sup>, NJ, sr262@njit.edu 3. Ornthida Sae Khowl<sup>1</sup>, NJ, os26@njit.edu 4. Anjali Mitra<sup>1</sup>, anjali\_mitra@yahoo.com The conventional approaches for the de-emulsification of biological colloids include chemical and physical methods. The former requires the addition of a demulsifier in order to achieve separation, while the latter involves heating or electrical techniques. De-emulsification using these methods tends to be expensive in terms of the cost of chemicals and energy requirements. In this study we explore the microwave induced demulsification of lipid-water colloids. The process was carried out in presence of dispersing agents such as surfactants. Microwave induced de-emulsification was completed in a matter of minutes and at very low temperatures. We postulate that the microwave couples differently with the polar molecules in the biocolloids, leading to breakdown of its stability. The de-emulsification efficiency of this process is compared to conventional thermal approaches.

**26391 Bacterial exopolysaccharides for corrosion inhibition on metal substrates** 1. ARS-USDA, National Center for Agricultural Utilization Research, Peoria, Illinois 1. Victoria L Finkenstadt<sup>1</sup>, ARS-USDA, National Center for Agricultural Utilization Research, 1815 N. University St., Peoria, Illinois, victoria.finkenstadt@ARS.USDA.gov 2. Claudiu Bucur<sup>1</sup>, 3. Kervin O Evans<sup>1</sup>, 4. Gregory L Cote<sup>1</sup>, 5. J.L. Willett<sup>1</sup>, Biofilms, composed of extra-cellular polymers secreted by bacteria, have been observed to both increase as well as decrease the rate of metal corrosion. Exopolysaccharides derived from *Leuconostoc mesenteroides* cultures have been shown to inhibit corrosion on corrosion-sensitive metals. The substantially pure exopolysaccharide has a (1→6)-linked D-glucose backbone and approximately 3-4% branching of (1→3) linkages. Pore resistance and corrosion rate were calculated from electrochemical impedance spectroscopy and linear polarization studies. The corrosion rate was at least 50% lower and the pore resistance was twice as high than control samples, indicating good inhibitory processes. This material may be useful in anti-corrosion coating applications.

**25442 Environmental stress alters tocopherols and isoflavones in soybean seeds** 1. U.S. Dept. Agriculture, Food Components and Health Lab, Beltsville, MD 1. Steven J. Britz<sup>1</sup>, U.S. Dept. of Agriculture, Food Components and Health Lab, Baltimore Ave., Beltsville, MD, steven.britz@ars.usda.gov Since temperature and soil moisture affect the amounts of tocopherols and isoflavones in soybean seeds, a multi-year study was undertaken to analyze seeds from lines representing a range of maturity groups grown at 3 locations in Maryland during 1999-2002. Small but significant increases in the proportion of alpha-tocopherol and decreases in isoflavones were observed in years with normal weather in soybeans grown under warmer conditions. Larger differences were observed in 2002, an extremely hot and dry year, but the biggest changes occurred in early maturing lines grown in warmer locations. The results indicate selection of later maturing lines or slight shifts in growing location can accommodate large extremes of temperature and soil moisture stress. Weather, location and planting date are useful proxies to evaluate effects of climate change. Parallel experiments in controlled environments indicate the main effect of elevated atmospheric CO<sub>2</sub> is to ameliorate the impact of environmental stress.

**25716 Sensitivity of lactic acid bacteria as a biomarker for the early detection of toxins in milk** 1. North Carolina Agricultural and Technical State U., Department of Family and Consumer Science, Greensboro, NC 2. North Carolina Agricultural and Technical State U., Dept of Natural Resources and Environmental Design, Greensboro, NC, 1. Madhavi H. Hathurusinghe<sup>2</sup>, madhavih2006@yahoo.com 2. Salam A. Ibrahim<sup>1</sup>, ibrah001@ncat.edu 3. Mehrdad Tajkarimi<sup>1</sup>, tajkarimi@gmail.com 4. Danfeng Song<sup>1</sup>, danfeng.song@gmail.com Most existing methods to detect toxins in food system are expensive and time-consuming. It is necessary to develop a simple and robust on-farm bioassay technique to detect toxins in milk before it leaves the farm and reduce the possibility of sabotage. The objective of this study was to determine effects of selected toxins on the growth of lactic acid bacteria and the potential to use lactic acid bacteria as a biomarker for early detection of toxins in milk. The sensitivity of different strains of bifidobacteria, *Lactobacillus* and commercially available yogurt culture to

serially diluted toxins, sodium cyanide, bromodiolone, brodifacoum and strychnine were tested. The bacterial growth was observed by optical density at different time intervals. Results showed all strains of *Lactobacillus reuteri* and *Bifidobacterium longum* were insensitive to the toxins tested. *B. adolescentis* and *B. breve* were sensitive to toxins but grew slowly and the inhibition was observed after 24 hours. Yogurt cultures were more sensitive to all toxins ( $p < 0.05$ ) at the level of  $1 \mu\text{g/ml}$  except for sodium cyanide which was  $0.1 \mu\text{g/ml}$  after 3-hour incubation. Results indicated yogurt cultures could be used as the sensitive culture and environmentally safe, rapid and accurate test kit as a universal marker for the early detection of sabotage or even a terrorist attack on the food system.

**26494 Deep ultraviolet light-emitting diodes (DUV-LEDs): A novel approach to determine wavelength response curves** 1. U.S. Dept. of Agriculture, Food Components and Health Lab, Beltsville, MD, 1. Steven J. Britz1 [steven.britz@ars.usda.gov](mailto:steven.britz@ars.usda.gov) Wavelength response curves can identify photoreceptors and mechanisms and are useful to optimize efficiency and minimize potential side effects of light treatments. DUV-LEDs ( $\approx 300 \text{ nm}$ ;  $10 \text{ nm}$  half-bandwidth) provide a facile means to this end. Many plants accumulate polyphenolic compounds after UV exposure, presumably as part of a protective response, but relatively few wavelength response curves are available. Therefore, the flavonoids cyanidin-3-malonylglucoside and quercetin-3-malonylglucoside were measured in red leaf lettuce following irradiation at  $10 \text{ mW m}^{-2}$  for 48 h using DUV-LEDs centered at 282, 296 or 308 nm. Treatment with 282 nm radiation was significantly more effective than 296 nm and produced more than 2-fold increases in both flavonoids compared to controls irradiated with amber light. DUV-LEDs should be useful for photobiological investigations and may also serve to improve the nutritional quality and appearance of plants grown under protected cultivation.

**13814 Dislodgeable foliar residues: Initial deposition on various crops in California** 1. California Environmental Protection Agency, Department of Pesticide Regulation, Worker Health and Safety Branch, Sacramento, CA, 1. Sheryl L. Beauvais1, [sbeauvais@cdpr.ca.gov](mailto:sbeauvais@cdpr.ca.gov) 2. Joseph P. Frank1, Dislodgeable foliar residue (DFR) is the pesticide residue that can be removed from both sides of treated leaf surfaces using an aqueous surfactant. DFR is assumed to be the portion of a pesticide applied to a crop that's available for transfer to people working in the crop. DFRs are frequently used to estimate fieldworker exposures in pesticide risk assessments. Because DFR data are available for a limited number of crop-chemical combinations, data from some crops may be used as surrogates for others. When data are lacking entirely, regulators often assume a default percentage (20%) of applied pesticide. We examined DFR data collected on the day of application for several crops and chemicals, to assess whether specific crops tend to have higher DFRs than others and the validity of the 20% default. We found that most DFRs were less than the 20% default, although samples occasionally exceeded this value.

**26471 Inhibition of cartilage collagen breakdown by dietary polyphenols** 1. Department of Biomedical and Pharmaceutical Sciences, College of Pharmacy, Kingston, RI 1. Dinorah Jean-Gilles1, 2. Liya Li1 3. Clinton O. Chichester1 4. Roberta S, King1 5. Navindra P. Seeram1, [nseeram@mail.uri.edu](mailto:nseeram@mail.uri.edu) Rheumatoid arthritis (RA) is a systemic autoimmune disease characterized by synovial hyperplasia and leading to the irreversible destruction of cartilage by proteolytic enzymes, mainly matrix metalloproteinases (MMPs). MMP-1 and -13 have attracted particular interest because they are elevated in RA, with MMP-13 having a greater efficiency towards the degradation of type-II collagen, the major protein component of articular cartilage. Emerging data suggests that several dietary polyphenols found in plant foods such as punicalagin (in pomegranate), catechin and epigallocatechin gallate (in tea), and quercetin (in fruit and onion) have anti-inflammatory properties. Therefore, we investigated the inhibitory effects of these four polyphenols on MMP-13-mediated type-II collagen degradation in vitro using the synthetic substrate TNO211 and type-II collagen. In a dose dependent manner, we found that punicalagin was the most effective polyphenol in preventing the breakdown of the substrates. Inhibitory effects of punicalagin against TNO211 degradation were observed at micromolar concentrations with an  $\text{IC}_{50}$  of  $31 \mu\text{M}$  and the effects against type II collagen degradation were seen at nanomolar concentrations. Previous research suggests that the stabilization of collagen by quercetin, catechin and epigallocatechin gallate are mediated through binding of their phenolic/hydroxyl groups to the side chains of collagen fibrils. Our modeling studies show that punicalagin can selectively bind to MMP-13 in addition to type-II collagen. Our results suggest that a natural product derived MMP-13 inhibitor, such as punicalagin, may have potential against arthritis.

**26317 Purification and anti-inflammatory capacity of dicaffeoylquinic acids in yerba mate (*Ilex paraguariensis*) dry leaves** 1. University of Illinois, Department of Chemistry, Urbana-Champaign, Illinois, 2. University of Illinois, Department of Food Science and Human Nutrition, Urbana-Champaign, Illinois, 1. Gregory Potts1, University of Illinois, Department of Chemistry,, Urbana, IL, [gkpotts2@illinois.edu](mailto:gkpotts2@illinois.edu) 2. Sirima Puangpraphant2, 3. Elvira Gonzalez de Mejia2 Mate tea (MT) has high antioxidant capacity, and caffeoyl derivatives are partially responsible for this activity. The objective was to purify dicaffeoylquinic acids (diCQAs) from MT leaves and to study their potential anti-inflammatory capacity in a cell-based system. Dry MT leaves were extracted with 100% methanol, partitioned in water and n-hexane (50/50 v/v), and chromatographed using MCI gel CHP20P column with water and methanol gradient elutions (20%-100%). Fractions (40% and 60%) were collected and eluted on ODS gel column with water and methanol (20%-70%). Twelve fractions were passed through RP-HPLC using C18 silica column, and caffeine, rutin, 3,4-diCQA, 3,5-diCQA, and 4,5-diCQA were identified by LC-MS (MH<sup>+</sup>/MH<sup>-</sup>). Main fractions presented a range of 0.5 - 3.8 mM as chlorogenic acid equivalents. Fractions with the highest diCQA concentrations produced significant inhibition of inducible nitric oxide synthase (iNOS), demonstrating their anti-inflammatory potential. Isolated diCQAs warrant further studies of their mechanism of action.

**26508 Bovine milk based infant formula promotes growth and acid production of probiotics** 1. North Carolina Agricultural and Technical State University, Department of Family and Consumer Science, Greensboro, NC, 1. Khalda Mohamedali1, [khaldam@hotmail.com](mailto:khaldam@hotmail.com) 2. Danfeng Song1, [danfeng.song@gmail.com](mailto:danfeng.song@gmail.com) 3. Salam A Ibrahim1, [ibrah001@ncat.edu](mailto:ibrah001@ncat.edu) Interest in the incorporation of probiotics into infant formula has developed considerably to improve infant health. Commercial infant formulas have begun to claim that they promote the growth of probiotics. The objective of this research was to determine the influence of commercial infant formula on the growth and acid production of probiotics. Five infant formulas and six strains of *Bifidobacteria* and *Lactobacillus* were tested. Bacterial growth was monitored at 3 hour intervals during 24 hour incubation by measuring pH values, total titratable acidity and bacterial count. Results showed the addition of different formulas had different effects on the growth of probiotics. *L. reuteri* CF2-7F and *L. GG B41031* grew fast and produced acid rapidly. Bovine milk protein hydrolysate based formula significantly enhanced the growth of *B. adolescentis* and

*L. reuteri* CF2-7F. Therefore, bovine milk protein hydrolysate based formula has beneficial effects in promoting the growth of probiotics and should be considered when selecting formula as an alternative for mother's milk.

**26522 Effect of Shiitake mushroom extract on growth of lactic acid bacteria and bifidobacteria** 1. North Carolina Agricultural and Technical State University, Department of Family and Consumer Science, Greensboro, NC2. North Carolina Agriculture and Technical State University, Natural Resources & Environmental Design, Greensboro, NC, 1. Osman Hassan1 , oahassan@ncat.edu 2. Danfeng Song1 , danfeng.song@gmail.com 3. Salam Ibrahim1 , ibrah001@ncat.edu 4. Omoanghe S ISIKHUEMHEN2 , omon@ncat.edu Probiotics, lactic acid bacteria and bifidobacteria can improve the immune system and are encouraged to grow by oligosaccharides and polysaccharides. Mushroom Shiitake (*Lentinus edodes*) contains potential antitumor polysaccharides and help improve immune responses. The objective of this study was to investigate the effect of the mushroom extract on the growth of lactic acid bacteria and bifidobacteria. *Lactobacillus reuteri* CF2-7F, *L. reuteri* DMS 20016, *Bifidobacteria breve* and *B. adolescentis* were tested with different concentrations of mushroom extract. Bacterial growth was monitored at 2 hour intervals by measuring optical density, pH, and titratable acidity. Results showed the growth of tested strains were significantly enhanced by the increasing concentrations of mushroom extract ( $p < 0.05$ ). CF2-7F grew fastest and reached to OD 1.50 with 4% mushroom extract compared to the control with OD 1.2 during 8 hour incubation. Lactic acid was produced and the pH decreased due to the rapid growth enhanced by the mushroom extract. Results suggest Shiitake mushroom extract can be used as natural additives to food products to improve the growth of lactic acid bacteria and bifidobacteria.

**26487 Turnover of red wine grape anthocyanins cultured in vitro** 1. University of California, Davis, Department of Viticulture and Enology, Davis, CA, 1. Alexander W Chassy1 , awchassy@ucdavis.edu 2. Andrew L Waterhouse1 Anthocyanins are flavonoids responsible for blue to red pigments in strawberries, blueberries, grapes, and many other fruits and vegetables. In wine grapes, anthocyanin content is highly reflective of quality. Red wine grapes are known to have fewer anthocyanins when produced in warm climates, however, the exact mechanism of anthocyanin loss is unknown. Using stable isotope ( $C^{13}$ ) labeled phenylalanine (Phe), a tracer was incorporated into anthocyanins of Cabernet Sauvignon grapes in vitro. The labeled Phe was removed from the system and the grapes were incubated in the dark for 24 hours at room temperature or 35°C. The loss of labeled anthocyanins over a 24 hour period was measured by HPLC/DAD/MS and used to estimate turnover. Individual anthocyanin turnovers were compared between the two temperature treatments.

**12170 Development of a headspace solid phase microextraction-gas chromatography method for the characterization of volatile compounds in Sufus** 1. The Chinese University of Hong Kong, Department of Biology, Shatin, N.T., Hong Kong Special Administrative Region of China 2. The Chinese University of Hong Kong, Department of Biology, Food and Nutritional Sciences Programme, Shatin, N.T., 1. Tsz Kei Jackie Chiang1 , anthonychung@cuhk.edu.hk 2. Hau Yin Chung2 , anthonychung@cuhk.edu.hk Sufu is a traditional Chinese fermented product with a soft creamy cheese-type texture made from soybean curd. It has been widely consumed in China as a condiment for many centuries. Previous investigations on its volatile compounds using simultaneous steam distillation and solvent extraction, supercritical fluid extraction or headspace extraction may suffer from drawbacks such as artifact formation, the use of organic solvents and the need for sophisticated equipment. Therefore, our primary objective in this study was to develop a quick volatile profiling method using the HS-SPME-GC for subsequent studies on commercial products and their changes during aging. Parameters including fiber coating types, extraction temperatures, exposure times, and sample volumes were optimized. A total of 45 volatile compounds were identified from the commercial products. Results agreed with previous studies that alcohols, acids and esters were qualitatively and quantitatively the dominant volatile components in sufu, and their concentrations increased during aging.

**26394 Evaluation of wax carriers for the controlled release of pheromones for mating disruption in an integrated pest management program** 1. Western Carolina University, Department of Chemistry & Physics, Cullowhee, NC 1. Cynthia A. Atterholt1 , ,atterholt@email.wcu.edu 2. Lisa M. McCracken1 : Insect pheromones can be used to control insect pests by mating disruption, as part of an Integrated Pest Management program. Insect pheromones are species specific, nontoxic, and can be released to the environment at low concentrations to interfere with insect communication. This controlled release of insect pheromones affects insect pest populations by interfering with the male insects' ability to locate female insects for mating. Pheromones have been used in some agricultural crops for pest management. This research has involved measurements of Oriental fruit moth, gypsy moth, and pink bollworm pheromone release rates under controlled conditions in the laboratory from paraffin and microcrystalline wax emulsions. Other formulation variables tested included the amount of emulsifier and the addition of an emulsion thickener. The specific pheromone and the type of wax affected the release rate, whereas the amount of emulsifier and thickener did not have a significant effect.

**26411 Characterization of colorants in fungal exudates, and enhancement of color by enzymes** 1. The Chinese University of Hong Kong, Department of Biology, Food and Nutritional Sciences Programme, Shatin, N.T., , Hong Kong Special Administrative Region of China 1. Hau Yin Chung1 anthonychung@cuhk.edu.hk 2. Lei Jin2 , anthonychung@cuhk.edu.hk Exudates from the fungus *Lentinula edodes* have a reddish brown color. One of its possible utilizations is to use it to replace the synthetic colorants currently used in food. However, before any application, further characterization of its major color components is necessary. As our preliminary investigations showed that phenolic components were present in the exudates, we believed the fungal phenolic components were likely contributing to the color that we observed. Since many components were able to form complex and remain stable in other species, the presence of similar complexes with the phenolics was hypothesized. Phenolics were identified by the Fourier Transform Ion Cyclotron Resonance Mass Spectrometry (FTICR-MS) in the exudates. In the presence of selected enzymes, phenolic content increased by 20% together with other color characteristics (hue angle and chroma). Such observations correlated well with the quantitative results from the identified phenolics monitored by the FTICR-MS.

**24329 Analysis of PBDEs, PCBs, and lipids in steelhead (*Oncorhynchus mykiss*) and liquid fish fertilizer** 1. University of Puerto Rico at Cayey, Department of Chemistry, Cayey, PR, 2. University at Buffalo, Department of Chemistry, Buffalo, NY, 1. Orielyz Flores1 , flores.orielyz@gmail.com 2. Sara J Lupton2, 3. Diana Aga2 , Polybrominated diphenyl ethers (PBDEs) are organobromine compounds that were widely used as flame-retardants. We analyzed congeners that contain 3-6 bromines, the most bioaccumulative, toxic, and widely

distributed in the environment. PBDE and PCB bioaccumulation and biomagnification across the food web is a current concern in Lake Erie. *Oncorhynchus mykiss* is the top of the food web in Cattaraugus Creek. Percent recoveries were obtained for PBDEs at high spike in a range of 56.89 % to 100% and low spike in a range of 44.83% to 128.86%. PCB recovery ranged from 17.4% to 171.1%, high recoveries are possibly due to residual PCBs present in fish samples. In addition several PCB congeners were analyzed in liquid fish fertilizer with significant levels found for PCB 101, 138, and 153. Comparison of gravimetric and colorimetric lipid analysis techniques gave similar results for almost all samples analyzed, with good reproducibility for both techniques.

**26296 Antidiabetic effect of the fruit of *Siraitia grosvenori*, the natural sweetener** 1. Shanghai Xuhui District Central Hospital, Shanghai, China 2. North Carolina Central University, Kannapolis, North Carolina, 1. Shilong Mao1 maoshilong@hotmail.com 2. Shengmin Sang2 , North Carolina Central University, Julius L. Chambers Biomedical/Biotechnology Research Institute, Kannapolis, NC, ssang@ncu.edu Abstract Body: The fruit of *Siraitia grosvenori*, also known as Luo-Han-Guo, has been used as a medicinal herb for treating coughs and sore throats in southern China for thousands years. Luo-Han-Guo has more recently been developed into a non-caloric sweetener. The sweet taste of Luo-Han-Guo comes primarily from mogrosides, a group of triterpene glycosides, present at the level of about 1% of the fleshy part of the fruit. In this study, we found that Luo-Han-Guo extract with 40% mogrosides could significantly decrease the fasting blood glucose levels in high-fat diet-induced obesity and diabetic mice. Luo-Han-Guo extract could possibly decrease fasting insulin levels but not with statistical significance. In addition, we also found that mogrosides are bioavailable in mouse plasma and urine.

**26279 Extraction, separation, identification and determination of the antioxidant activity of triterpenes from skin of *Poria cocos*** 1. Huazhong Agriculture University, College of Food Science and Technology, Wuhan, Hubei, China 2. South Central University for Nationalities, College of Life Science, Wuhan, Hubei, China 3. North Carolina ATState University, Department of Family and Consumer Sciences, Greensboro, NC, 1. Wen Huang1 , Huazhong Agriculture University, College of Food Science and Technology, Wuhan, Hubei, China , huangwen@mail.hzau.edu.cn 2. Gang Cheng2 cheng\_gang28@yahoo.com.cn 3. Si Sheng1 , 4. Ting Han1 , 5. Hong Yang1 , yangh@mail.hzau.edu.cn 6. Salam A Ibrahim3 , ibrah001@ncat.edu *Poria cocos*, is a specific and traditional herb in China, having very remarkable biological activities and pharmacological functions. The objectives of this study were to extract, separate, identify and determine the antioxidant activities of triterpenes in the skin of *Poria cocos*. Skin of *Poria cocos* were purchased from the Dabie mountain area, Hubei, China. The triterpenes content in the skin of *Poria cocos* was 1.59% determined by the colorimetry of vanillic aldehyde-acetic acid-perchloric acid. The optimal extraction conditions of triterpenes were the ratio of liquid (ethanol) to solid (sample) (v/w) 1:20 for two times at 70°C for 6hr. The extraction rate of triterpenes was 95.2%, and the purity of the extracted sample was 78.5%. The different triterpenes extracted from the crude triterpenes of the skin of *Poria cocos* were separated and purified by column chromatography with silica gel, and identified by UV, IR, HPLC and mass spectroscopy. The spectra showed that the extracts from the skin of *Poria cocos* had varieties of triterpenes and 18 kinds of triterpenes were identified. The antioxidant activity of the crude triterpenes and the purified fractions were determined by scavenging and malonaldehyde. Results indicated that the crude triterpenes had better antioxidant activity than those purified fractions. Thus, the triterpenes in the skin of *Poria cocos* may be a potential alternative in radical therapy.

**26282 Synthesis and characterization of cationic starch flocculation prepared by a dry process with mechanically activated treatment** 1. Huazhong Agricultural University, College of Food Science and Technology, Wuhan, Hubei China 2. North Carolina ATState University, Department of Family and Consumer Sciences, Greenboro, NC, 1. Liangzi Zhang1 , 2. Yongliang Xu1 , 3. Shanbai Xiong1 , 4. Siming Zhao1 , Huazhong Agricultural University, College of Food Science and Technology Wuhan, Hubei, China , zsmjx@mail.hzau.edu.cn 5. Hong Yang1 , yangh@mail.hzau.edu.cn 6. Salam A Ibrahim2 , ibrah001@ncat.edu In recent years, cationic starches (CS) with a high degree of substitution (DS) are of increasing interest. CS with a DS from 0.2 to 0.9 is the most promising candidate to replace synthetic flocculants in various industrial applications, such as domestic and waste water treatment, sludge dewatering, and mineral beneficiation. The reasons starch was used as a raw material for cationic flocculants are related to the biodegradability and relatively low price of starch. The objectives of this study were to optimize the reaction conditions for the synthesis of CS flocculants. CS flocculants were synthesized using cationic moiety 2,3- epoxypropyltrimethylammonium chloride by a drying process with corn starch activated by ball-milling treatment. The effects of mechanical activation, ball-milling time, sodium hydroxide dosage and reaction conditions on the flocculation performance were investigated. Microstructure characterization of cationic starch and starch flocculation were elucidated by infrared spectrum (IR), X-ray diffraction (XRD) and scanning electron microscopy (SEM). Mechanically activated starch granules were cracked while their crystal structures were destructed, resulting in the enhancements of reaction activity and reaction efficiency (RE). Results indicated that adding NaOH as catalyst would not increase the flocculation performance. Starch flocculation synthesized with mechanically activated starches at 90 °C for 2.5 hr in the presence of ETAC with molar ratio of 0.70:1.00 showed significantly better flocculating performance ( $P < 0.05$ ) than those with regular starches. The degree of substitution (DS=0.30) and RE (75.06%) could be obtained under the optimal conditions.

**26289 RP-HPLC-ESI-MS/MS analysis of oligomeric procyanidins in sorghum episperm from China** 1. Huazhong Agricultural Univ., College of Food Sci. and Tech., Wuhan, Hubei, China 2. North Carolina ATState Univ., Dept of Family and Consumer Sci, Greensboro, NC, 1. Rui Liu1 , liurui@mail.hzau.edu.cn 2. Liman Xu1 , 3. Jie Yang1 , 4. Xiaoling Zhu1 , 5. Hong Yang1 yangh@mail.hzau.edu.cn 6. Salam A Ibrahim2 , ibrah001@ncat.edu Procyanidins, the active polyphenolic compounds existing extensively in the plant, have gained much attention in recent years due to their antioxidant properties. Procyanidins exist in abundance in the episperm of sorghum (1.24%-8.42%), which has been considered an agricultural by-product or waste. The objective of this study was to extract pure procyanidins from sorghum episperm (SPC) through purification steps. Another objective of this study was to identify the main components in SPC that have antioxidant activity. An ethanol-water solution (70%) is used to extract SPC. ADS-17 macroporous resin is applied to purify SPC, while HPLC-ESI-MS/MS is employed to identify procyanidins in SPC. Our results showed that the purity of SPC after purification is 97.4%. This purification procedure would yield 2.2%. The main components of procyanidins were one dimer, two trimers, and one catechin/epicatechin monomer from the HPLC-ESI-MS spectra. There were also glucoside meletins in SPC that have high antioxidant properties. Our results demonstrated that the episperm of sorghum could be used to provide procyanidins as a potential source for antioxidant compounds.

**26291 Antitumor activity of rice bran polysaccharides extracted by different methods** 1. Huazhong Agricultural Univ., College of Food Sci and Tech, Wuhan, Hubei, China 2. North Carolina ATState Univ, Dept of Family and Consumer Sciences, Greensboro, NC 1. Yuqin Ding1 , 2. Xiaolong Shao1 , 3. Siming Zhao1 , 4. Shanbai Xiong1 , xionsb@mail.hzau.edu.cn 5. Hong Yang1 , yangh@mail.hzau.edu.cn 6. Salam A Ibrahim2 , ibrah001@ncat.edu Polysaccharides extracted from rice bran have been reported to possess anti-tumor and immunostimulating activities. The objective of this study was to investigate the antitumor activities of rice bran polysaccharide (RBP) extracted by different methods in vitro and in vivo. Six RBPs were isolated by hot-water extraction (RBP1), microwave-assisted extraction (RBP2), protease-treated (RBP3), amylase-treated (RBP4), cellulose-treated (RBP5) and combined-enzymes-treated (RBP6), respectively. The in vitro anti-tumor effects of six RBPs were investigated, and then the in vivo anti-tumor activities of RBP2 and RBP3 were evaluated on Sarcoma 180-bearing mice. The effects of RBPs on Sarcoma 180 growth inhibition, weight of immune organ, the content of SOD, GSH-Px and MDA in serum, and pathological slice of tumor and liver cells of tumor-bearing mice were examined. Our results showed that six RBPs could suppress the in vitro growth of Sarcoma 180 in different degree, and RBP2 and RBP3 exhibited stronger tumor-inhibiting activity. RBP2 and RBP3 had dose-dependent anti-tumor activity in vivo. RBP3 also exhibited significant antioxidant activity in vivo, while histopathological and morphological analyses showed that the destruction of liver cell caused by RBP 3 was weaker compared to cyclophosphamide. These results demonstrated that extraction methods of RBPs had significant effect on their anti-tumor activities, and the anti-tumor activity of RBP might be mediated by their anti-oxidant activity and enhancing immune function.

**26292 Effects of different processing methods on quality of soybean milk** 1. Huazhong Agricultural Univ., College of Food Science and Technology, Wuhan, Hubei, China 2. North Carolina ATState Univ., Department of Family and Consumer Sciences, Greensboro, NC, 1. Lijun Zhao1 , 2. Siming Zhao1 , 3. Xiaoding Li1 , 4. Shanbai Xiong1 xionsb@mail.hzau.edu.cn 5. Hong Yang1 a yangh@mail.hzau.edu.cn 6. Salam A Ibrahim2 , ibrah001@ncat.edu Soybean seeds have a protein content of 35-40% on a dry weight basis, which makes them a relatively inexpensive source of protein for human consumption. Soybeans have been transformed into various forms of soy foods. Processing condition could impact the quality of soy foods. The objective of this study was to determine suitable processing technology producing high-quality soybean milk. Using Heilongjiang yellow soybeans as raw materials, soybean milk were produced with dry beans (Dry-process), beans soaked at 30\_ for 4 hours (wet-process), beans soaked at 50\_ for 1.5 hours (beating or grinding), respectively. The results showed that soaking treatment was critical for influencing soybean milk's protein digestibility, viscosity as well as the contents of solid, crude protein and fat, starch, and isoflavone. Beating could increase the contents of solid, dietary fiber, starch, crude protein and fat in soybean milk. Grinding enhanced isoflavone content and improved the digestibility of protein and fat. Consequently, wet-process is the best processing technology considering its simple manufacture and product with good stability, good sensory quality and easy digestion.

**26268 Comparison of different immobilized systems in the removal of peanut allergens from peanut extracts** 1. USDA-ARS, Department of Food Processing and Sensory Quality, New Orleans, LA, 2. 1. Si-Yin, siyin.chung@ars.usda.gov 2. Elaine T Champagne1 The objective of this study was to determine which of the magnetic-bead systems (Ca<sup>2+</sup>, Fe<sup>3+</sup>, caffeic acid, hydrophobic) would bind and separate peanut allergens from other proteins in a peanut extract more efficiently. Commercial Ca<sup>2+</sup> and hydrophobic magnetic beads, and caffeic-beads (prepared by attaching caffeic acids to aminoethyl beads in the presence of carbodiimide) were each treated (rotated) with roasted peanut extracts. In addition, plain beads were treated with peanut extracts that had been incubated with Fe<sup>3+</sup>. After beads treatment, all extracts were retrieved on a magnetic device that separated beads from the extracts. Protein/allergens that bound to the beads were retrieved by regenerating the beads with 1 M NaCl, and analyzed by SDS-PAGE and ELISA using a pooled plasma from peanut-allergic donors. Results showed that the majority of major peanut allergens were removed from the extracts by the 4 magnetic-bead systems, and IgE bindings were reduced. However, a significant amount of other proteins were also removed. It was concluded that while the magnetic-beads systems captured major peanut allergens, the systems were not much different from each other in their specificity for peanut allergens for separation from other proteins in the extracts.

**24544 Effects of moisture content and puffing pressure on the extraction yield and saponin contents of puffed Platycodon grandiflorum** 1. Kyung Hee University, Department of Food Science and Biotechnology, Yongin, Republic of Korea 2. Osan College, Department of Culinary Arts, Osan, Gyeonggi-do, Republic of Korea 1. A Young Kim1, mooyeol@khu.ac.kr 2. Hae Yeong Kim1 3. Sung Won Choi2 , 4. Moo Yeol Baik1 Effects of moisture content and puffing pressure on extraction yield and crude saponin contents of puffed Platycodon grandiflorum were investigated. Platycodon grandiflorum were sliced and dried to 4.0, 6.0, 8.0, 10.0% MC and then puffed at various pressure (7, 8, 9, 10kgf/cm<sup>2</sup>) using a rotational puffing gun. Extraction was performed with 70% ethanol and crude saponin was obtained using water saturated butanol. Puffed Platycodon grandiflorum showed relatively higher extraction yield and crude saponin contents than control. Extraction yield increased from 35.4 % to 62.1 % and crude saponin contents also increased from 1.8 to 6.0 (mg/g sample). Although puffing increased both extraction yield and crude saponin contents, moisture content and puffing pressure did not greatly influence the extraction yield but dramatically affected crude saponin contents. Puffing could change both physical and chemical properties of Platycodon grandiflorum resulting in increase of extraction yield and crude saponin contents.

**24547 Monitoring the ginsenoside profile of raw, white, red and black ginsengs** 1. Kyung Hee University, Department of Food Science and Biotechnology, Yongin, Republic of Korea 2. Osan College, Department of Culinary Arts, Osan, Republic of Korea 1. Ji Hye Shin1 mooyeol@khu.ac.kr 2. Sung Won Choi2 , 3. Moo Yeol Baik1 4. Hae Yeong Kim1 , Changes of ginsenoside profile of ginsengs (raw, white, red, black) by steaming process were investigated. White ginseng is produced from fresh ginseng by dehydration by sunlight, while red ginseng is manufactured by steaming fresh ginseng at 97~98\_ for 2~3 h. Black ginseng is developed from fresh ginseng by nine cycles of steaming at 98\_ for 2~ 3h. Both extraction yield and crude saponin contents did not show great difference in all samples indicating that steaming process did not greatly affect both extraction yield and crude saponin contents. HPLC chromatogram clearly showed that steaming process transformed thermally unstable malonyl ginsenosides into corresponding neutral ginsenosides. Ginsenosides Rg3, Rg5, Rh2, Rg2, Rs4 and Rs5, known to be hydrolyzed saponins, found only in red or black ginsengs. However, in case of major ginsenosides, Rb1, Rb2, Rc and Rd (representative ginsenosides in raw ginseng) decreased with steaming and transformed to hydrolyzed saponins.

**24328 Identifying Cytochrome P450 3A4 isoenzyme activity in CHO cells treated with choline bitartrate** 1. Pontifical Catholic University of Puerto Rico, Department of General Science, Ponce, Puerto Rico, 1. Christian Repollet-Otero1 cmrepo@gmail.com 2. Lizette Santos-Santori2 lsantos@email.pucpr.edu Choline, a natural amine and essential nutrient, is the base for many metabolic functions in the body; including acetylcholine synthesis. This research focuses on CYP 3A4 isoenzyme, which oxidizes the largest range of substrates in the P450 oxidase system. Appropriate dosage for cell treatment was determined to be 5ppm through a toxicity bioassay using brine shrimp (*Artemia S.*). CHO cells were cultured, and then exposed to treatment for 48 hours. Enzymatic activity was measured through luminosity readings using a P450 GLO-Assay which detects luminescent signals emitted by enzyme CYP 3A4 specifically. Control cell results showed an average concentration of 0.2556 ?g/mL, while treated cells presented an average concentration of 0.1278 ? g/mL. Results demonstrate moderate inhibition of the CYP3A4 isoenzyme when exposed to choline bitartrate treatment.

**24364 Study of the photostability of THSG under light and temperature at equal pace** 1. Tianjin University of TCM, Department of TCM, Tianjin, Tianjin, China 1. Ren Xiao-liang1 , ,xiaoliang\_ren@sina.com 2. Wang Gui-fang1 , 3. Qi Ai-di1 Objective To evaluate the photostability of 2,3,5,4'-tetrahydroxystilbene -2-O-?-D- glycoside (THSG) in buffer solution by using the photodegradation kinetic parameters. Method To determine the content in different temperature(34\_d\_h\_p\_) under natural light and incandescent light by HPLC. Results In experiments with either isothermal heating or exposure to light at different temperature ,the first-order degradation reaction was confirmed for THSG. The photostability of THSG in buffer solution is: incandescent light,natural light.The total rate constant,ktototal,caused by both light and heat can be divided into two parts:ktotal=kdark+klight,where kdark and klight are the rate constants caused by heat and light,respectively.The constant of reaction rate(k) is 1.96 and half-life is 0.35h under natural light.According to the different temperature under incandescent light, the activation energy(Ea) of the photochemical reaction is 6.53×104J·mol-1. In experiments with HPLC,a new peak is found before the peak of THSG.Supposed that it possibly be a degradation product of the photochemical reaction. Conclusion Because the form of klight is similar to the Arrhenius equation,it is suggested that Ea,light might be the observed activation energy of the rate-determining step of the subsequent processes of the photochemical reaction.The photostability of THSG in buffer solution can be evaluate by photodegradation kinetic parameters

**24384 Treatment of propolis with supercritical carbon dioxide to remove some allergenic esters** 1. ENEA, Department of BIOTEC-AGRO, ROMA, Italy 1. Andrea Aliboni1 andrea.aliboni@enea.it 2. Armando D'Andrea1 Propolis is a beehive product very popular for its health benefits, but known to spark allergic reactions in many users. Also, the chemical complexity of propolis has not been fully analysed to determine its full range of benefits and risks. The BIOTEC-AGRO Group of ENEA (Italy) has been researching and analysing propolis safety, and is implementing the production of an anallergic propolis, a product that will likely appeal a wider group of consumers. To this end, the treatment with supercritical carbon dioxide is interesting because it does not alter the natural properties of the propolis. The extraction of three allergenic esters, benzyl salicylate benzyl cinnamate and phenylethyl caffeate was monitored in time dependent experiments, and the efficiency of the supercritical medium was evaluated. The extraction of benzyl salicylate was quantitative. Benzyl cinnamate left residues even at long extraction times. Phenylethyl caffeate was very poorly extracted.

**24063 Effects of melamine on the Maillard reaction between lactose and phenylalanine** 1. The University of Hong Kong, School of Biological Sciences, Hong Kong Special Administrative Region of China 2. Jinyu Ma1 iaoma@hku.hk 2. Xiaofang Peng1 , 3. Ka-Wing Cheng1 , 4. Ricky Kong2 , 5. Ivan K. Chu2 , 6. Feng Chen1 , 7. Mingfu Wang1 Recently, much attention has been paid to the adulteration of melamine in food products. Up till now, the formation of melamine-cyanuric acid cocrystals in kidneys has been identified as a major health consequence from the consumption of melamine-contaminated food products. However, considering its structural characteristics, its occurrence in such high levels in adulterated food products will likely have a large impact on many quality attributes of foods. Moreover, melamine might also react with other food components to form various new chemical entities. In the present study, effects of melamine on the Maillard reaction were investigated in chemical model systems. The reaction products in the model systems with/without melamine were analyzed by GC/MS and LC-MS/MS. Impact of melamine on Maillard browning in the above models was also examined by colorimetric methods. It was found that melamine can react directly with lactose and Strecker aldehydes formed in Maillard reactions to produce new adducts. In addition, the presence of melamine in chemical model systems also affects the formation of Maillard flavors and browning.

**24306 Simultaneous determination of unconjugated metabolites of trenbolone acetate and 17beta-estradiol in bovine serum by liquid chromatography-tandem mass spectrometry** 1. Texas Tech University, Department of Environmental Toxicology, Lubbock, TX, 1. Qingsong Cai1, qingsong.cai@tiehh.ttu.edu 2. Jiafan Wang1 , 3. George P. Cobb1 , Trenbolone acetate (TBA) is a synthetic anabolic steroid. It was used alone or combined with other estrogens, such as 17beta-estradiol (E2), as a powerful growth promoter in cattle husbandry practices. After ear implantation, TBA is rapidly hydrolyzed to 17beta-trenbolone (17beta-TBOH), the active form which is further biotransformed to trendione (TBD) and 17alpha-trenbolone (17alpha-TBOH). When used appropriately, they have proven beneficial effects in veterinary medicine. However, inappropriate use of these compounds can result in negative effects, mediated primarily through endocrine disruption. Therefore, the need to detect and quantify these compounds in bovine serum is of interest from pharmacokinetics and chemical-residue monitoring perspectives. GC-MS and radioimmunoassay (RIA) have traditionally been used to quantify E2, and TBA metabolites in biological samples. However, the ELISA method is less specific due to antibody cross-reactivities, and GC-MS analysis is limited to volatile steroids or steroids readily derivatized to volatile compounds. Herein, a specific and sensitive method based on liquid chromatography-tandem mass spectrometry using electrospray ionization (LC-ESI-MS/MS) has been developed for the determination of free E2 and three major TBA metabolites in bovine serum. Deuterated E2 and 17beta-TBOH were used as internal standards. The sample preparation essentially involved liquid-liquid extraction followed by cleanup on solid-phase extraction cartridges and derivatization. The procedure was optimized to obtain maximum recovery and minimum signal suppression/enhancement. The analytes were analyzed by reversed-phase LC-MS/MS, acquiring one or two diagnostic product ions from the precursor ion for the unambiguous confirmation. The method was validated according to the European Commission Decision 2002/657/EC guidelines. The limits of detection and limits of quantitation were found to be 0.1 ng/mL and 0.2 ng/mL, respectively. The accuracy and precision have been determined, with recoveries in the range of 86% to 108% and the relative standard deviation less than 15% at spiked levels of 0.5 to 5 ng/mL.

**22731 Analyzing food and water with magnetic levitation** 1. Harvard Univ., Dept of Chemistry and Chemical Biology, Cambridge, MA 1. Katherine A Mirica1 , kmirica@gmwgroup.harvard.edu 2. Scott T Phillips1 , sphillips@psu.edu 3. Charles R Mace1 , cmace@gmwgroup.harvard.edu 4. Zhihong Nie1 , znie@gmwgroup.harvard.edu 5. George M Whitesides1 , gwhitesides@gmwgroup.harvard.edu This poster describes a versatile technique based on magnetic levitation (MagLev) for analyzing food and water based on density. We use MagLev to compare different kinds of rice, distinguish different oils of plant origin based on their content of polyunsaturated fat, and measure salinity and hardness of water. The measurements involve suspending a sample in a container filled with a paramagnetic solution (Mn(II) or Gd(III) in water and/or organic solvent) and placing the container between two permanent NdFeB magnets oriented with like poles towards one another. The vertical position of the sample within the device correlates with the density of the analyte.

**22746 Rate of potassium application alters the antioxidant activity and phenolic composition of basil (*Ocimum basilicum* L.)** 1. Southwestern U., Dept of Chemistry and Biochemistry, Georgetown, TX, 1. Phuong M. Nguyen1 , fernnguyen@gmail.com 2. Emily D. Niemeyer1 niemeyee@southwestern.edu In the current study, we explore how the rate of potassium application affects the phenolic levels and antioxidant properties within leaves from three basil cultivars: Dark Opal, Sweet Thai, and Genovese. Potassium application had a significant effect on the total phenolic content in Dark Opal and Sweet Thai basil, with leaves grown using the highest potassium rate containing greater phenolic concentrations than those grown at lower potassium levels. Similarly, potassium application impacted rosmarinic and chicoric acid concentrations in Dark Opal and Sweet Thai basil, with higher potassium rates corresponding to increased phenolic acid levels. Dark Opal and Sweet Thai basil grown with the lowest potassium rate had lower DPPH (2,2'-diphenyl-1-picrylhydrazyl) free-radical scavenging activity and FRAP (ferric reducing antioxidant power) antioxidant capacity compared to basil treated at higher potassium levels. Interestingly, total and individual phenolic concentrations and antioxidant activities were not affected by potassium application for the Genovese cultivar. Potassium fertilizer application was also found to have no effect on anthocyanin levels in the basil cultivars studied.

**23703 Identification of important food pathogens using LNA (Locked Nucleic Acid) probes** 1. University of Idaho, Department of Chemistry, Moscow, Idaho, 1. Seth Gibbon1 , 2. Michael E Østergaard1 , 3. Josh R Branan1 , 4. Patrick J Hrdlicka1 hrdlicka@uidaho.edu Detection of food pathogens prior to the distribution of contaminated products is pivotal to food safety monitoring. Recent progress has allowed advancement of pathogen identification from standard culturing techniques to more rapid methods, such as PCR and other nucleic acid based detection platforms that do not require the time, effort and waste that can result from holding products in the processing facility. Locked nucleic acids (LNAs) and analogs hereof have the potential to greatly improve the speed and accuracy of nucleic acid identification. Here we present the detection of DNA signature sequences of four important food pathogens (*Escherichia coli* O157:H7, *Salmonella enterica*, *Listeria monocytogenes* and *Camphylobacter jejuni*) using an LNA-based sandwich assay. The high affinity and selectivity of LNA allows the use of short probe sequences (13-15 nucleotides) resulting in rapid hybridization kinetics while maintaining sensitivity (less than 1 pM target sequence) and specificity (no cross reaction between pathogen sequences).

**23923 Heavy metal concentrations in baby formula purchased from U.S. supermarkets** 1. Missouri Univ of Science and Technology, Department of Chemistry, Rolla, MO 2. Missouri Univ of Science and Tech, Dept of Civil, Architectural, and Environmental Engineering, Rolla, MO, 3. Missouri Univ of Sci and Tech, Environmental Research Center, Rolla, MO, 1. Brandi N Clark1, bncww4@mst.edu 2. Jianmin Wang2 , 3. Honglan Shi3 , Heavy metals are a greater health concern for children than adults. In fact, for some metals, research suggests that any level of exposure can be detrimental to neurological development. According to CDC data, only 14% of infants in the U.S. rely exclusively on breast milk in the first 6 months of life. Therefore, it is expected that detailed information about the presence of heavy metals in infant formula will be instrumental in predicting infant exposure in the U.S. To this end, approximately 40 samples spanning four major U.S. infant formula brands were purchased and prepared using microwave-assisted digestion and the concentrations of 15 elements were measured. Mercury was measured with a Tekran 2600 (EPA 1631E); other elements were measured using ICP-MS and GFAA. Since many of the elements measured are not regulated in formula in the U.S., concentrations were compared to EPA standards and food standards in other countries. No samples violate Chinese food standards for As and Pb; one sample violated the WHO recommendation for Pb. All samples tested were within FDA nutrient requirements for Zn and Cu. Of the elements that are regulated in the EPA primary drinking water standards, no samples violated the standards for As, Cd, Cu, Pb, Sb, and Hg, but most samples violated the limits for Se and Cr. In addition, one-way ANOVA was used to determine whether variation in metal concentrations is significant across formula brand at the 95% confidence level. Al, As, Cr, Cu, Pb, and Zn vary significantly across brand, while Hg, Co, Cd, Mo, Ni, Sb, and Se do not.

**24050 Method of creating starch-like ultra-fine rice flour and effect of spray drying on formation of free fatty acid** 1. USDA, ARS, Food Processing Sensory Quality Unit, New Orleans, LA, 1. Harmeet S Guraya1 harmeet.guraya@ars.usda.gov 2. Isabel M Lima1 , , isabel.lima@ars.usda.gov 3. Elaine Champagne1 , Rice flour from long, medium and waxy grain cultivars were processed by passing a 32% rice flour slurry through a microfluidizer at 10 x 104 kPa and spray dryer at three different outlet temperatures, (50°C, 80°C and 115°C). Spray drying conditions were controlled by the flow-rate of the slurry and inlet temperature. Spray dried rice flours and unprocessed rice flour were examined for their lipolytic stability during storage for 210 days by measuring free fatty acid (FFA) formation. The percentage of lipid and FFA in rice flour was significantly reduced by spray drying. The resulting amount of lipid and percentage FFA was rice type dependent and related to the amylose content and the outlet temperature. Upon storage, the formation of FFA was lowest for rice flours processed at 115°C outlet temperature as compared to 80°C, 50°C and control (untreated rice flour). Pin milling of the spray dried flour resulted in the breakdown of loose re-agglomerated rice flour formed during spray drying with a particle size similar to rice starch but increased starch damage by about 1% per pass through pin mill.

**24144 Sulfur-containing components from pineapple (*Ananas comosus*)** 1. The University of Hong Kong, School of Biological Sciences, Hong Kong Special Administrative Region of China 1. Zong-Ping Zheng1, zzpsea@hotmail.com 2. Jianfei Chao1, cpuchjf@msn.com 3. Jin-Yu Ma1 , 4. Qin Zhu1 , qinz1981@hotmail.com 5. Mingfu Wang1 , mfwang@hkusua.hku.hk Two new sulfur-containing compounds, N-L- ? - glutamyl-S-coniferyl-L-cysteine (1), S-p-hydroxycinnamylglutathione (2), and four known sulfur-containing compounds,

N-[N-L-?-glutamyl-S-[3-(4-hydroxy-3-methoxyphenyl)-2-propenyl]-L-cysteinyl]-glycine (3), N-L-?-glutamyl-S-sinapyl-L-cysteine (4), S-sinapylglutathione (5), S-sinapyl-L-cysteine (6) were isolated from the fruits of pineapple. Their structures were identified the interpretation of their spectral data (MS, 1H-NMR and 13C-NMR). These sulfur-containing compounds were found to show moderate tyrosinase inhibitory activity. The IC50 values of compound 1, 3, 4, 5, 6 are lower than 1mM. The other important finding related to these sulfur-containing compounds is their moderate protective activity against 6-OHDA induced neurotoxicity. This is the first time to report the neuroprotective activity of this class of compounds.

**24172 Protective effects of proanthocyanidins on insulin signaling pathways impaired by methylglyoxal in 3T3-L1 adipocytes** 1. The University of Hong Kong, School of Biological Sciences, Hong Kong, China 1. Xiaofang Peng1, xiaofang@hkusua.hku.hk 2. Jinyu Ma1 , 3. Jianfei Chao1 , 4. Feng Chen1 , 5. Mingfu Wang1 , Methylglyoxal (MGO) is a highly reactive carbonyl compound capable of provoking many deleterious biochemical changes through interfering with specific amino acids of intracellular proteins, thus affecting their structures and functions. Recently, increased accumulation of endogenous MGO has been demonstrated to impair insulin-stimulated signaling, disturb glucose metabolism and decrease insulin-induced glucose uptake, which may promote the pathophysiology of diabetes in general. In this study, the protective effects of several proanthocyanidins on insulin signaling pathways impaired by MGO were investigated in 3T3-L1 adipose cells. Results confirmed that MGO could damage insulin-simulated signaling and behaved in a dose-dependent manner. Moreover, it is shown that proanthocyanidins including catechin, epicatechin and procyanidin B2 could protect insulin signaling pathways against the impairment caused by MGO to some extent.

**25862 Characterization of protease of over-ripe fruits and their utilization using the optimization technique** 1. Department of Food Science and Biotech, Yong-In, Gyunggido, Republic of Korea 1. Ji Hye Koak1 , lodestinyve@naver.com 2. Chang Yong Moon1 , 3. Young Tae Hahm1 , 4. Cheon Seok Park1 , 5. Moo Yeol Baik1 , 6. Byung Yong Kim1 , This study aimed to analyze the characteristics of extracted protein enzymes from the over-ripe, used-up fruits such as kiwi, grape, apple and pear and to produce the optimum mixing ratio for the food ingredients using an optimization technique. Kiwi fruit showed the highest protease activity (921.08 unit) and grape showed the medium activity (225.86 unit), while the pear and apple showed lower values, 97.75 and 78.29 units, respectively. After a certain period of time (2 weeks), the protease activities of all over-matured fruits increased approximately 16.9%, and the maximum protease activities were shown at the temperature ranges of 50-60\_ depending on the fruits. Failure stress and stress relaxation were measured after adding the over-ripened fruits to beef. The subsequent tenderizing was dependant upon the mixing ratio of each protease activity. The more kiwi added, the more the beef texture turned softer and instantaneous stress and the elastic component of beef was smaller when applied to the three element rheological model. But the viscous component of over-matured fruits using the mixture design and optimization technique, and its functionality could be enhanced due to total dietary fiber and DPPH radical scavenging activities of over-ripe fruits

**25865 Optimization of processing conditions for cold storage and heated Chunbokjang with abalone** 1. Department of Food Science Bio tech, YONGIN, GYUNG GI, Republic of Korea 1. CHANGYONG MOON1 , YONGIN, GYUNG GI, Republic of Korea , miniyong@hanmail.net 2. MOOYEOL PARK1 , 3. CHEONSUK PARK1 , 4. BYUNGYONG KIM1 , 5. YOUNGTAE HAHM1 , 6. HAEKYUNG KIM1 , The objective of this study was to optimize the processing conditions to make a cold storage and heated Chunbokjang with a highly nutritious and tasty abalone. Starch syrup and water were set as independent variables, and upper and lower limits of starch syrup (150-250 mL) and water (500-600 mL) were set for the mixture design. Taste and flavor showed linearity, while texture and preference showed a quadratic model for blending ingredients. Optimum blending formulation for the cold storage Chunbokjang was set at 59% of water and 19% of starch syrup with other fixed ingredients. The heat penetration curve was obtained for the heated Chunbokjang according to the different blanching time, solid contents and different heat processing. The 100°C for 2 min blanching condition, 125°C for 6.9 min heat treatment produced the highest overall preference, but solid content did not show any significant effect. Also, the rate of heat penetration was reduced as solid contents were increased. Using the mixture design and optimum technique, highly acceptable Chunbokjang using abalone and other ingredients was made, and its storage life was well extended.

**25870 Development of less-allergenic nutrients based on gelatinization of cereals** 1. National Food Research Institute, Protein Laboratory, Tsukuba, Ibaraki, Japan 1. Hiroyuki Yano1, hyano@affrc.go.jp The gelatinization/saccharification of rice has long been utilized to obtain syrup. In this paper, we report that in the gelatinization of rice slurry, most proteins interact so tightly with starch or its derivatives that they become inextractable, even when treated with an SDS solution. Subsequent saccharification by amylase yields an insoluble protein-inclusive substance that can be eliminated by a light centrifugal force as low as 60 x g or higher. The glucose-rich supernatant contains almost no protein. Even exogenous proteins, added before gelatinization, are rendered inextractable and eliminable by gelatinization and subsequent saccharification. This separation protocol is also useful for wheat, buckwheat, and soybean processing. These findings can be applied to produce proteinless nourishment, which should be beneficial for allergic and renal patients.

**25912 Phytochemicals in silky dogwood (Cornus amomum) fruit** 1. Bioactive Botanical Research Laboratory, Department of Biomedical and Pharmaceutical Sciences, College of Pharmacy, University of Rhode Island, Kingston, RI, 1. Hang Ma1 , 2. Liya Li1 , 3. Navindra P. Seeram1, nseeram@mail.uri.edu Dogwood (Cornus spp.) plants are widely distributed in northeastern United States and are commonly utilized for ornamental purposes because of their attractive and colorful flowers and fruit. Some dogwood species for e.g. C. officinalis have been used in Traditional Chinese Medicine for various medicinal purposes. Although previous research has been conducted on some dogwoods, the silky dogwood fruit are yet to be investigated. The purple-white berries of the silky dogwood tree were collected on the Kingston campus of the University of Rhode Island and exhaustively extracted in a series of organic solvents. Subsequent chromatographic isolation (including XAD-16 resin, C-18 prep-HPLC, and silica gel columns) and spectroscopic (LC-MS/MS and NMR) procedures afforded five compounds including two flavonols (quercetin, 3-O-methylquercetin), two anthocyanins (delphinidin-trihexoside, delphinidin-dihexoside), and a phenolic acid (tyrosol). This is the first reported phytochemical investigation of silky dogwood fruit.

**25820 Melt processing of zein with polyvinylpyrrolidone and Cloisite® nanoclay** 1. USDA/ARS/NCAUR, Plant Polymer Research, Peoria, IL, 1. Kristen K. Woods1 , kristen.woods@ars.usda.gov 2. David J. Sessa1 , david.sessa@ars.usda.gov In an attempt to improve

the tensile properties of zein articles, polymer blends of zein with various amounts of polyvinylpyrrolidone (PVP) and Cloisite nanoclay were created. Samples were melt processed on a Brabender single screw extruder with a 3:1 compression screw, then compression molded into bars. For the zein/PVP blends, three different molecular weights of PVP were used between 2.5 and 20% by zein weight. Zein/PVP blends showed a 10-15% increase in tensile strength for bars stored at 50% RH. This increase was not seen for samples with higher levels of PVP stored at 70% RH. For zein samples blended with both PVP and Cloisite, the PVP and Cloisite Na<sup>+</sup> were used at concentrations from 1 to 5% by zein weight. Initial testing has shown that zein samples containing 5% Cloisite Na<sup>+</sup> exhibited a tensile strength increase of 5-10% compared to control, along with a comparable increase in elongation. Zein samples containing both PVP and Cloisite Na<sup>+</sup> exhibited a 10-15% increase in tensile strength and elongation.

**13780 Pesticides levels in wines from the Niagara region of Canada** 1. Food Research Division, Health Canada, Ottawa, Ontario, K1A 0K9, Canada 1. Dorothea F.K. Rawn<sup>1</sup>, thea\_rawn@hc-sc.gc.ca 2. Sue C. Quadel<sup>1</sup>, 3. Wing-Fung Sun<sup>1</sup>, Although most organochlorine insecticides have not been registered for use in Canada since the 1980s, endosulfan continues to be used on grapes for the control of grape phylloxera in the province of Ontario. Wines produced from Ontario grapes were sampled in 2007 for endosulfan analysis (n = 99). Wine samples were extracted using a multi-residue method with acetone (2:1) and cleaned up using gel permeation chromatography and Florisil. Analyses were performed using gas chromatography-high resolution mass spectrometry. Total endosulfan detection frequency was 71% and when detected, concentrations ranged from 0.001 to 0.028 ng/g. Endosulfan levels observed in the present study are well below the maximum residue limit (MRL) (1,000 ng/g) for total endosulfan on raw grapes. Because a multi-residue method was used, iprodione also was measured in these wines. Iprodione levels ranged from 0.28 to 300 ng/g, which is below the MRL for this fungicide in wine (5,000 ng/g).

**25257 Isolation and identification of unknown compounds from puffed red ginseng** 1. Kyung Hee University, Department of Food Science and Biotechnology, Yongin, Republic of Korea 1. Mi Rim Ko<sup>1</sup>, mooyeol@hotmail.com 2. YoungEun An<sup>1</sup> 3. Byung Yong Kim<sup>1</sup> 4. Moo Yeol Baik<sup>1</sup>, The chemical structure of ginsenosides could be changed during the puffing process. Isolation and identification of unknown compounds from puffed red ginseng were performed. The red ginseng (9.8 % MC) was puffed at 7 - 10 kgf/cm<sup>2</sup> using a rotational puffing gun. The puffed red ginseng roots were extracted with 70% aqueous ethanol, and obtained extracts were partitioned using diethyl ether, water-saturated n-butanol, and water, successively. In HPLC analysis, amounts of minor ginsenosides increased with increasing puffing pressure. Among minor ginsenosides, there were two main unknown compounds which were isolated from the n-butanol fraction through repeated silica gel (Kiesel gel 60, 63~200 mm) and octadecyl silica gel (Lichroprep RP-18, 40~63 mm) column chromatography's. From the result of <sup>1</sup>H- and <sup>13</sup>C-NMR data, the chemical structures of these two unknown compounds was determined as a 20 (S)-ginsenoside Rg<sub>3</sub> (compound 1) and ginsenoside Rg<sub>5</sub> (compound 2), which have been known to have strong anti-cancer activity.

**25611 Physicochemical properties of non-thermally acetylated and cross-linked cornstarches with POCl<sub>3</sub> using ultra high pressure** 1. Kyung Hee University, Department of Food Science and Biotechnology, Yongin, Republic of Korea 1. Jin Woo Park<sup>1</sup>, mooyeol@hotmail.com 2. Cheon Seok Park<sup>1</sup> 3. Moo Yeol Baik<sup>1</sup> 4. Byung Yong Kim<sup>1</sup> Effect of ultra high pressure (UHP) on physicochemical properties of dual-modified cornstarch with acetic anhydride and POCl<sub>3</sub> were investigated. For UHP- ACCL sample, cornstarch was acetylated with acetic anhydride (12%, v/w) at 400MPa for 15min and then cross-linked with POCl<sub>3</sub> (0.05%, v/w) at 400MPa for 15min, respectively. Cornstarch was cross-linked and then acetylated under UHP for UHP-CLAC sample. More cross-linking and less acetylation occurred in both conventionally and non-thermally dual-modified cornstarches compared to single modified cornstarches. Higher swelling power and solubility were observed in both conventionally and non-thermally dual-modified cornstarches. Acid and shear stabilities of dual-modified cornstarches were similar to those of native cornstarch. In RVA pasting properties, both conventionally and non-thermally dual-modified cornstarches revealed decrease in pasting temperature, peak viscosity, breakdown and holding strength compared to native cornstarch. Conventional CLAC cornstarch showed the lowest pasting temperature and the highest peak viscosity possibly due to more substitution reaction.

**25615 Physicochemical properties of non-thermally acetylated and cross-linked cornstarches with STMP using ultra high pressure** 1. Kyung Hee University, Department of Food Science and Biotechnology, Yongin, Republic of Korea 1. Suntham Chotipratoom<sup>1</sup> mooyeol@hotmail.com 2. Byung Yong Kim<sup>1</sup> 3. Moo Yeol Baik<sup>1</sup> 4. Cheon Seok Park<sup>1</sup> Title: : Effect of ultra high pressure (UHP) on physicochemical properties of dual-modified cornstarch with acetic anhydride and STMP (Sodium tri-metaphosphate) were investigated. For UHP-ACCL sample, cornstarch was acetylated with acetic anhydride (12%, v/w) at 400MPa for 15min and then cross-linked with STMP (12%, v/w) at 400MPa for 15min, respectively. Cornstarch was cross-linked and then acetylated under UHP for UHP-CLAC sample. Overall, less acetylation and cross-linking occurred in both conventionally and non-thermally dual-modified cornstarches compared to single-modified cornstarches. Higher swelling power and solubility were observed in dual-modified cornstarches except conventional CLAC cornstarches. Only conventional ACCL cornstarch showed relatively higher acid stability compared to native cornstarch. Conventional CLAC cornstarches did not showed RVA pasting properties possibly due to strong cross-linking reaction. However, all UHP single- and dual- modified corn starches revealed relatively lower pasting temperature and similar peak viscosity compared to native cornstarch indicating less cross-linking reaction under UHP.

**25616 Physicochemical properties of non-thermally hydroxypropylated and cross-linked cornstarches with POCl<sub>3</sub> using ultra high pressure** 1. Kyung Hee University, Department of Food Science and Biotechnology, Yongin, Republic of Korea 1. Sang Soo Lim<sup>1</sup>, mooyeol@hotmail.com 2. Byung Yong Kim<sup>1</sup> 3. Moo Yeol Baik<sup>1</sup> 4. Cheon Seok Park<sup>1</sup> Effect of ultra high pressure (UHP) on physicochemical properties of dual-modified cornstarch with propylene oxide and POCl<sub>3</sub> were investigated. For UHP-HPCL sample, cornstarch was hydroxypropylated with propylene oxide (12%, v/w) at 400MPa for 15min and then cross-linked with POCl<sub>3</sub> (0.05%, v/w) at 400MPa for 15min, respectively. Cornstarch was cross-linked and then acetylated under UHP for UHP-CLHP sample. UHP single- and dual-modified cornstarches revealed more hydroxypropylation and cross-linking than conventional samples. Swelling power and solubility of both conventionally and non-thermally dual-modified cornstarches were relatively higher than native cornstarch. Both conventional and UHP-HPCL cornstarches revealed higher acid stability compared to native cornstarch. No difference was observed in shear stability. In RVA pasting properties, all samples revealed relatively lower pasting temperature than native cornstarch. Both UHP-HPCL and UHP-CLHP

cornstarches revealed dramatically higher peak viscosity compared to other samples suggesting that synergistic substitution reaction occurred in UHP dual-modification.

**25618 Physicochemical properties of non-thermally hydroxypropylated and cross-linked cornstarches with STMP using ultra high pressure** 1. Kyung Hee Univ, Dept of Food Sci and Biotechnology, Yongin, Rep of Korea 1. Chang Won Kim1 , mooyeol@hotmail.com 2. Cheon Seok Park1 3. Moo Yeol Baik1 4. Byung Yong Kim1 Effect of ultra high pressure (UHP) on physicochemical properties of dual-modified cornstarch with propylene oxide and STMP (Sodium tri-metaphosphate) were investigated. For UHP-HPCL sample, cornstarch was hydroxypropylated with propylene oxide (12%, v/w) at 400MPa for 15min and then cross-linked with STMP (12%, v/w) at 400MPa for 15min, respectively. Cornstarch was cross-linked and then acetylated under UHP for UHP-CLHP sample. More hydroxypropylation and less cross-linking occurred in both conventionally and non-thermally dual-modified cornstarches compared to single- modified cornstarches. All dual-modified cornstarches revealed relatively higher swelling power and solubility compared to native cornstarch except conventional-CLHP cornstarch. Only UHP-HPCL cornstarch showed relatively higher acid stability compared to native cornstarch. In RVA pasting properties, both conventionally and non-thermally dual-modified cornstarches showed relatively lower pasting temperature and higher peak viscosity compared to native starch except conventional-CLHP cornstarch. Conventional- HPCL cornstarch revealed strongly substituted cornstarch property with the lowest pasting temperature and the highest peak viscosity.

**25632 Studies of the lignins of the bamboo species *Phyllostachys incarnata* Wen** 1. College of Forestry, Northwest AFUniversity, Yangling, Shaanxi, China 2. State Key Laboratory of Pulp and Paper Engineering, South China University of Technology, Guangzhou, Guangdong, China 3. Institute of Biomass Chemistry and Technology, Beijing Forestry University, Beijing, China 1. Pai Peng1 , 2. Feng Peng2 , 3. Jing Bian3 , 4. Feng Xu3 , 5. Run Cang Sun2., rcsun3@bjfu.edu.cn. Seven lignin fractions were isolated by sequential treatments of dewaxed bamboo powder with distilled water, 0.5% and 1% NaOH, 60% ethanol containing 1% NaOH, and 3%, 5% and 8% NaOH with a solid to liquid ratio of 1:20 (g ml<sup>-1</sup>) at 60 °C for 3 hr. The yields of the lignin fractions were 0.54%, 2.63%, 3.01%, 3.88%, 2.06%, 1.12% and 0.78%, respectively. This sequential extractions together resulted in the dissolution of 62.26% original lignin and 80.10% original hemicelluloses. All alkali-soluble lignins contained rather low amounts of neutral sugars (0.01-1.11%), and the weight-average molecular weights ranged between 970 and 3430 g mol<sup>-1</sup>. The studies also showed the degradable lignins were rich in Sunits and contained small amounts of ester- and ether-linked p-coumaric and ferulic acids. Moreover, the β-O-4 linkage is a major linkage type and small amounts of β-β and β-5 linkages are also present in the lignin molecules.

**24269: Inhibition of *Candida* spp. and *Cryptococcus neoformans* by cranberry extracts (*Vaccinium macrocarpon*)** 1. University of Massachusetts-Dartmouth, Department of Chemistry and Biochemistry, North Dartmouth, Mass 2. University of Massachusetts-Dartmouth, Department of Medical Laboratory Science, North Dartmouth, Mass 1. Kunal D. Patel1 , kpatel2@umassd.edu 2. Catherine C. Neto1 , With growing emphasis on natural products to maintain health, our research focuses on cranberry. Extracts of the fruit (*Vaccinium macrocarpon*, var. Early Black) inhibited the growth of human pathogens including *Cryptococcus neoformans*, *Candida krusei*, *Candida tropicalis* and *Candida albicans*. These fungi have been associated with human infections, especially in immunocompromised patients. Preliminary screening using a 24-48 hour disk diffusion assay showed inhibition by the crude polyphenolic extract, phenolic acid and proanthocyanidin (PAC) fractions. An adaptation of a standard reference method, microdilution assay M27-A3, was employed to determine dose-response. Cranberry fractions and standard phenolic compounds were assayed against the four pathogens. *C. krusei* and *C. neoformans* were sensitive to PAC even at the lowest concentration tested (125 ? g/ml) and inhibition was near or comparable to that of positive control. *C. albicans* and *C. tropicalis* were inhibited to a lesser extent. This method may also be adapted to investigate other antimicrobial activities.

**15127 New method for determination of trace molybdenum in food** 1. Nanchang University, State Key Laboratory of Food Science and Technology, Nanchang, Jiangxi, China 1. Hua-Hong Yu1 , hongtougao@sina.com.cn 2. Feng Lv1 , Molybdenum is one of the trace elements, which is essential to the human body. It can suppress or eliminate the carcinogenic effects of nitrosamines. The human body absorbs the element mainly from food digestion. Rapid and highly sensitive methods for the determination of molybdenum in food are always being pursued. We have developed a new catalytically dynamic spectrophotometric method for the assay of trace molybdenum, which is simple in operation and has high sensitivity and excellent selectivity. It has been successfully applied to determine the trace molybdenum in soy bean, Chinese sorghum, pork liver, etc.

**15479 Protective effects of histidine and carnosine in mice consuming saturated fat** 1. China Medical University, Department of Nutrition, Taichung city, Taiwan Republic of China 2. Chung Shan Medical University, Department of Nutrition, Taichung, Taiwan Republic of China 1. Ying Shih1 bluejesss@hotmail.com 2. Cheng-Chin Hsu2 king@csmu.edu.tw 3. Mei-Chin Yin1 mcyin@mail.cmu.edu.tw Histidine and carnosine (beta-alanyl-L-histidine) are endogenously synthesized peptides found in organs. Our present study examined the effects of histidine and carnosine in mice consuming 5% saturated fat. Mice were divided into 4 groups: normal diet with water, saturated fat with water, histidine, or carnosine for 5 weeks. Results indicated that the intake of saturated fat caused an increase in body weight, epididymal fat weight, LDL, TG, and total cholesterol; and decrease in hepatic GSH level and activity of GPx and SOD. Intake of histidine or carnosine at 1%, however, significantly reduced oxidative stress by increasing the level or activity of GSH, GPx and SOD in the liver. Histidine or carnosine also appeared to significantly diminish the formations of LDL, TG, and total cholesterol. Based on the observed anti-oxidative and anti-obesity effects, the supplements of these agents might be able to attenuate the risk of obesity.

**14964 Analysis of lipase-catalyzed enzymatic reactions for the production of renewable and biodegradable compounds** 1. Institute of Biotechnology, Department of Biothermodynamics and Drug Design, Vilnius., Lithuania 2. Vilnius University, Department of Biochemistry and Biophysics, Vilnius, Lithuania 3. Institute of Chemistry, Department of Materials Science and Corrosion Research, Vilnius, Lithuania 1. Birute Surinenaite1 ,Institute of Biotechnology, Department of Biothermodynamics and Drug Design, V.A. Graiciuno str. 8, Vilnius, Vilnius, Lithuania , birute@ibt.lt 2. Gervydas Dienys1 3. Vida Bendikiene2 , 4. Vaidotas Kiseliovas1 , 5. Ramunas Beliuonas1 , 6. Svajus Asadauskas3 , Resinase HT (Novozymes) lipase-catalyzed reactions were analyzed. Transesterification of oils with butanol showed that the conversion of sunflower oil provided 60% of desired products. Catalysis was more effective in emulsions although emulsifying agents

depressed the process. Transesterification of oils with glycols was slow. The highest yield of fatty acid ethylene glycol esters after 150 hours was 87% from camelina oil, of propylene glycol esters - 50% from linseed oil and of diethylene glycol esters - 71% from rapeseed oil. Glycols depressed enzymatic activity. Emulsified oils were converted more rapidly but emulsifying agents affected enzymatic activity. Transesterification of trimethylolpropane showed that pure oils were converted by 31% during 96 hours. Oil emulsions were transesterified up to 55% over 72 hours. Biosynthesis of carbohydrate derivatives with fatty acids proceeded very slightly over 24 hours. In the biosynthesis of glycerol oleates in general 65% of mono-, di- and triacylglycerols were synthesized over 24 hours.

**14247 Effects of low-intensity microwave radiation on *Tribolium castaneum* physiological and biochemical characteristics and survival** 1. Huazhong Agricultural University, Department of College of Food Science and Technology, Wuhan, Hubei, China 1. Lu H.H1, lhh@webmail.hzau.ced.cn 2. Zhao S.M1, zsmjx@mail.hzau.ced.cn 3. Xiong S.B1, prof, Huazhong Agricultural University, College of Food Science and Technology, Wuhan, Hubei, 430070, China xiongsb@mail.hzau.edu.cn The red flour beetle, *Tribolium castaneum* (Coleoptera: Tenebrionidae) is a widespread pest that lives in, and feeds on, wheat flour. Here, we studied the effects of low-intensity microwave radiation (LIMR)—which apparently does not damage flour—on physiological and biochemical characteristics of *T. castaneum*, and compared them to the effects of heat, to provide a theoretical basis for using LIMR for pest control. Lethal model equations were found to accurately simulate the effects of LIMR on the mortality of *T. castaneum*. Semi-lethal and lethal temperatures induced through LIMR (48°C and 50°C, respectively) for *T. castaneum* were lower than those induced through heat conduction (50°C and 52°C). Moisture content, pH values, alkaline phosphatase and acetyl cholinesterase activity were lower, peroxide and total free amino acid content increased, and protein subunits molecular weights smaller when *T. castaneum* were subjected to LIMR than to heat conduction; moreover, after LIMR exposure, amino acids were changed and DNA was damaged.

**14839 Effects of *Fructus Ligustri Lucidi* on lipogenic hormones and antioxidative enzymes in mice obesity** 1. Chung Shan Medical University, Radiation Safety Office, Taichung City, Taiwan, Taiwan Republic of China 2 1. Wen-hu Liu1, andy4819@yahoo.com.tw 2. Te-chung Liu2, 3. Cheng-chin Hsu2, *Fructus Ligustri Lucidi* is the dried fruit of *Ligustrum Lucidus* Ait (Glossy Privet). This study evaluated the effects of aqueous extracts of this fruit on the variation of lipogenic hormones and antioxidative enzymes in obese C57BL/6J mice. A low dose aqueous extract (100 g/L) or high dose aqueous extract (200 g/L) was added to drinking water for ten weeks, for mice consuming a high fat diet. Results showed that the intake of high dose extract significantly reduced serum insulin, leptin and resistin levels; and lowered body and adipose tissue weights. These aqueous extracts also significantly decreased the serum level of CRP and TNF- $\alpha$  in a dose-dependent manner, and significantly enhanced the hepatic GSH level and GPX activity; as well as diminished MDA production in liver (P<0.05). These results support the fact that *Fructus Ligustri Lucidi* is a potential agent for reducing body fat and protecting the liver against obesity-induced oxidative and inflammatory injury.

**14876 Protective effects of *Solanum muricatum* Ait extract in mice diabetes** 1. Chung Shan Medical University, School of Nutrition, Taichung City, Taiwan, Taiwan Republic of China 1. Zhi-hong Wang1, rover\_wang@hotmail.com Pepino melon pear (*Solanum muricatum* Ait) is a popular plant food on the Penghu island of Taiwan. In this present study, we examined the protective effects of *Solanum muricatum* Ait extract in type one diabetic mice. This extract, at 5%, was added into the mice diet for four weeks. These results showed blood glucose levels had slightly declined; but the intake of this extract significantly decreased oxidative stress in the kidney, determined as TBA-value, via restoring the activity of glutathione peroxidase (P<0.05). The intake of this extract also significantly lowered serum activity of aldose reductase, an enzyme responsible for the limiting rate of polyol pathway; as well as reducing the release of renal fibrinogen, a marker of inflammatory stress (P<0.05). These findings suggested that this plant food may be able to alleviate diabetes associated oxidative, glycolytic and inflammatory injury.

**11405 Effects of beer-battering on the frying properties of wheat or rice batters and their coated foods** 1. Southern Regional Research Center, New Orleans, Louisiana, 1. Fred Shih1, fred.shih@ars.usda.gov 2. Karen Bett-Garber1 3. Elaine Champagne1 4. Kim Daigle1, 5. Jeanne Leal1, Rice and wheat batters were prepared with and without the use of beer replacing water in the formulation. During frying, rice batters were found to absorb substantially lower oil, by about 50%, than the wheat counterparts with or without beer. With beer in the formulation, oil uptake of fried batters with rice or wheat flours generally increased by up to 18%. Instrumental textural analyses indicate that beer-battering treatment generally decreased the hardness, increased the fracturability and improved the crispness of the fried batters. Sensory evaluations show similar trends, though to a lesser extent than those from instrumental textural analysis, that fish and onion ring coated with batters were softer but crispier with beer than without. Overall, the effect of beer-battering is more pronounced in improved frying properties such as crispness for rice batters than wheat batters.

**12265 Effects of operation parameters on the supercritical fluid extraction of oleuropein from olive tree (*Olea europea*) leaves** 1. Istanbul University, Department of Chemical Engineering, Istanbul, Turkey 1. Selin Ahin1., selins@istanbul.edu.tr 2. Mehmet Bilgin1, (mbilgin@istanbul.edu.tr) Research on optimizing extraction methods of olive leaves, which represent almost 10% of the total weight of olives, has been of great value. The present study focuses on developing methods for olive leaf extraction and obtaining extracts, rich in oleuropein, which is the most abundant phenolic compound in olive leaves. Dried and ground olive leaves were extracted by means of a supercritical fluid extraction (SFE) method. SFE of olive leaf and its oleuropein content were investigated in the presence of a co-solvent. Ethanol, methanol and water were selected as co-solvents. The co-solvent percentage was chosen as 20% (v/v). Effects of pressure, temperature and type of co-solvent on the amount of both extract and oleuropein were studied. Extract and oleuropein yields were determined as a function of temperature (50-100°C) and pressure (100-300 bars). CO<sub>2</sub> modified by 20% methanol (v/v) was found to give the best results as co-solvent with the oleuropein yield of 14.24 mg/g dried leaf at 300 bar and 100°C. Quantitative analysis was performed using a liquid chromatography-electrospray ionization-tandem mass spectrometry (LC-ESI-MS/MS) technique.

**12678 Investigation of extract obtaining methods from olive tree (*Olea europea*) leaves: The effect of ethanol** 1. Istanbul University, Department of Chemical Engineering, Istanbul, Turkey 1. Mehmet Bilgin1, mbilgin@istanbul.edu.tr 2. Selin Ahin1, selins@istanbul.edu.tr This study aimed to optimize the methods of olive extraction and the content of its phenolic compound, oleuropein, by

means of investigating the parameters affecting the extraction process through supercritical fluid extraction (SFE) versus Soxhlet methods. SFE was applied to the leaves by using CO<sub>2</sub> as supercritical fluid and 20% ethanol (v/v) as co-solvent. The influences of operating parameters such as temperature (50-100 °C) and pressure (100-300 bar) on extract and oleuropein yields were investigated. Quantitative analysis was performed using a liquid chromatography-electrospray ionization-tandem mass spectrometry (LC-ESI-MS/MS) technique. CO<sub>2</sub> modified by 20% ethanol (v/v) was found to give the best results with the oleuropein yield of 2.90 mg/g dried leaf at 300 bar and 50°C. However, the highest value was obtained by the same solvent system at 300 bar and 100°C with a quantity of 220.24 mg/g dried leaf in terms of extract yield. SFE was found to be 10 times more efficient than a Soxhlet method with respect to oleuropein yield.

**11908 Antioxidative and anti-inflammatory effects of caffeic acid and naringenin on streptozotocin-induced diabetic mice** 1. China Medical University, Department of Nutrition, Taichung City, Taiwan Republic of China 1. Wing Yiu Kam<sup>1</sup>, philipkam@hotmail.com 2. Yu-Ru Guo<sup>1</sup>, dinyty@hotmail.com 3. Mei-Chin Yin<sup>1</sup>, mcyin@mail.cmu.edu.tw Caffeic acid (CA) and naringenin (Nar) are phenolic compounds presented in many plant foods. Previous study has indicated that these compounds based on their antioxidant activities could offer hyperglycemic effect in diabetic rodents. In our present study, the protective effects of CA and Nar against renal injury in Streptozotocin-induced diabetic Balb/C mice were examined. Mice were divided into normal group (without DM), control group (DM), CA group (DM with 2% CA), Nar group (DM with 2% Nar). After 4 week supplement, results showed that CA or Nar treatment significantly decreased blood glucose level, elevated renal glutathione level, and retained renal activity of superoxide dismutase and catalase. CA or Nar intake also significantly reduced renal level of interleukin-6 and tumor necrosis factor-alpha. These findings suggest that CA and Nar may protect kidney against the development of diabetic nephropathy via their anti-inflammatory and anti-oxidative activities.

**10087 Rheological and microstructural changes in Queso Fresco during storage** 1. USDA, ARS, ERRC, Dairy Processing & Products Research Unit, Wyndmoor, PA, 1. Michael H. Tunick<sup>1</sup>, michael.tunick@ars.usda.gov 2. Diane L. Van Hekken<sup>1</sup>, mtunick@arserrc.gov Queso Fresco is a traditional Hispanic cheese that is increasing in popularity in the United States. In an effort to understand more about the physical chemistry of this product and its impact on shelf life, rheological and microstructural studies were performed on samples refrigerated at 4 and 10°C for up to 8 wk. The hardness of all cheeses as measured by texture profile analysis (TPA) was low and within a narrow range. In the cheeses stored at 10°C, the TPA cohesiveness decreased with time, indicating structural breakdown; the cheeses stored at 4°C showed a small decrease. The elastic and storage moduli for the 4°C samples increased with storage time, but the moduli for the 10°C samples did not. Torsion shear stress and shear strain increased for all samples from 1 to 8 wk. Scanning electron microscopy revealed that the protein matrix was tighter and less open for the 4°C cheeses. The results show that Queso Fresco stored at 4°C retains its internal structure to a greater extent than cheeses stored at 10°C, which indicate that keeping this cheese well-refrigerated is important for retaining its textural quality.

**10925 Bisphenol A in canned soft drink products sold in Canada** 1. Health Canada, Food Research Division, AL: Ottawa, ON, Canada 1. Xu-Liang, Xu-Liang\_Cao@hc-sc.gc.ca The method based on solid phase extraction and derivatization with acetic anhydride followed by GC-MS analysis was validated and used to analyse samples of 72 canned soft drink products for BPA. Except for three products from which BPA-d16 could not be recovered at all due to interference of product compositions, BPA was detected in samples of all the other products at levels ranging from 0.032 to 4.5 ug/L. About 75% of the products had BPA levels less than 0.5 ug/L, and 85% of the products had BPA levels less than 1 ug/L. Exposure to BPA through consumption of canned soft drink products is low; dietary intake of BPA was estimated at 0.027 ug/kg body weight/day based on consumption of one canned soft drink with the highest BPA level (4.5 ug/L) for an adult with 60 kg body weight, well below the provisional tolerable daily intake of 25 ug/kg body weight/day established by Health Canada.

**11755 Study on microencapsulation of goose fat liver with considerable amounts of lecithin** 1. Qingdao Agriculture University, College of Food Science and Engineering, Qingdao, Shandong, China 1. Cheng Han<sup>1</sup> 2. Song-song Cai<sup>1</sup> 3. Jing-xin sunjingxin@163.com Goose fat liver is riched in unsaturated fatty acid, especially lecithin, which has important nutrition value. But lecithin is easily oxidizeable, and the fat-soluble properties of goose fat liver limits its application as a nutrition additive. Microencapsulation can prevent goose fat liver from oxidation and deterioration. In this study, goose fat liver was microencapsulated using complex coacervation of gelatin/gum arabic, transglutaminase (TG) as a cross-linking agent. The preparation technology and ability to antioxidation were studied. Preparation of microcapsules was investigated and the optimal parameters were found as follows: pH 4.7, the ratio of gelatin to gum Arabic was 1:1, colloid concentration was 1.2%, the ratio of core to wall was 1:2, stirring speed was 300-400 r/min, at these conditions microcapsules were smooth, uniform, spherical and multinuclear. The ratio of TG to gelatin was 25U/g gelatin and it solidified the microcapsules for four hours. The optimal amount of antioxidant was: vitamin E 1000 mg/kg and TBHQ 500 mg/kg. After keeping in 80° water base for 90 min, the morphology of microcapsules did not change; the retention rate of lecithin was 94.71%; and microcapsules were stable. Double encapsulation of complex coacervation microcapsules was investigated. Results showed that: double encapsulation by millard reaction product can protect goose fat liver from oxidation and reserves the functional ingredients of goose fat liver. After storage at 45° for 15 days, the retention rate of lecithin in double encapsulated microcapsules was 92.56%. Microcapsules after double encapsulated by maltodextrin and gum Arabic were shrunken; microcapsules after double encapsulated by millard reaction products were smooth, compact and integral and no holes or cracks were found. Physical properties of double encapsulated microcapsules were studied. The moisture was 4.08±0.05%, the density was 0.54±0.06 g/ml, and the repose angle was 36.7°±0.9°. PrePrint: 1\_abstract\_of\_han.pdf

**11744 Improved extraction and analysis of lipids after acid or base hydrolysis** 1. Dionex Corporation, Sunnyvale, California, 2. Dionex Corporation, Salt Lake City, Utah, 1. SM Rahmat Ullah<sup>1</sup>, rahmat.ullah@dionex.com 2. Kannan Srinivasan<sup>1</sup> 3. Chris Pohl<sup>1</sup> 4. Brian Dorich<sup>2</sup> 5. Brett Murphy<sup>2</sup> 6. Bruce Richter<sup>2</sup> 7. Eric Francis<sup>2</sup> 8. David Knowles<sup>2</sup> Accelerated solvent extraction (ASE) is a high temperature and high pressure extraction technique that is widely used for various extraction protocols in food analysis. Presently, ASE is used for the rapid extraction of components of interest with organic solvents from food samples. It is difficult to pursue ASE extraction with acid or base hydrolyzed samples due to the corrosive nature of the reagents and material limitations. In this presentation we used ion exchange based materials to neutralize acid or base reagents in cell from acid or base hydrolyzed food samples. We present here performance data of the new method for lipid analysis for a variety of food samples and compare the method with the Mojonnier method. Additionally we

will discuss a new solvent saver mode of operation that lowers the solvent usage. The new methods presented here enhance the utility of ASE and eliminates labor intensive protocols.

**11172 Antiangiogenic peptides production through bovine and human plasminogen proteolysis and anticancer activity analysis** 1. California Polytechnic State University, Dairy Products Technology, San Luis Obispo, CA, 1. Erin Stefanutti1 , estefanu@calpoly.edu 2. Rafael Jiménez-Flores1 , rjimenez@calpoly.edu Antiangiogenic approaches on methods to treat or prevent cancer have seen promising outcomes in the past 40 years. Angiostatin, the internal fragment of the fibrinolytic enzyme plasminogen, has shown great potential in reducing cancer size and number of metastatic colonies in animal models. Plasminogen is also present in milk. The objective of this research was to: 1) investigate the ability of proteases, such as *Bacillus polymyxa* protease and elastase in cleaving plasminogen and release the angiogenesis inhibitor; 2) identify and characterize the angiostatin like fragment through SDS-PAGE, western blotting, MALDI-TOF MS and column chromatography; 3) test anticancer activity on human malignant melanoma and colon cells. The results confirmed the ability of enzymes in producing angiostatin from both human and bovine plasminogen, as well as ability of these fragments in delaying cancerous cells proliferation compared to the control. Interestingly, best inhibition was observed in samples treated with bovine sources. These findings may be a starting point for future production of novel dairy products (i.e. yogurt) enriched in angiogenesis inhibitors

**11265 Iron as an essential cause of the fishy sensation in wine and seafood pairings** 1. Mercian Corporation, Product Development Research Laboratory, Fujisawa, Kanagawa, Japan 1. Takayuki Tamura1 tamura-t@mercian.co.jp 2. Kiyoshi Taniguchi1 , 3. Yumiko Suzuki1 , 4. Toshiyuki Okubo1 , 5. Ryoji Takata1 6. Tomonori Konno1 , As a guideline, white wine with fish or white meat and red wine with red meat, are accepted by most culinary knowledgeable consumers. When red wine clashes with fish, an unpleasant fishy sensation seems to be perceived in mouth. However, there are exceptions to the rule; some red wine actually goes well with seafood. Therefore, we studied the formation mechanism of the fishy sensation in wine and seafood pairings. We proposed one new property of iron in wine by sensory analysis. The ferrous ion is a key component in the formation of the fishy sensation in wine and seafood pairings within the concentration range commonly found in wine. Furthermore, we propose a formation mechanism of the fishy sensation as follows. The fishy sensation was likely due to development of a retronasal aroma. The ferrous ion in wine can instantly promote the carbonyl compounds responsible for fishy sensation by the breakdown of preformed lipid hydroperoxides derived from unsaturated fatty acids in seafood

**19232 C-Geranyl flavonoids from Paulownia tomentosa fruits displaying potent neuraminidase inhibition** 1. Gyeongsang National University, Division of Applied Life Science, JinJu, Republic of Korea 2. Korea Research Institute of Bioscience and Biotechnology, Jeongseup, Republic of Korea 1. Jung Keun Cho1 , moolten0528@naver.com 2. Young Bae Ryu2 , ybryu@kribb.re.kr 3. Woo Song Lee2 , wslee@kribb.re.kr 4. Ki Hun Park1 , khpark@gnu.ac.kr Criteria are met: Are met by at least one author Twelve flavonoids(1-12) possessing neuraminidase inhibitory properties were isolated from the methanol(95%) extract of *Paulownia tomentosa*. The isolated compounds consisted of seven flavanones(1-7) and five dihydroflavonols(8-12), all which are substituted geranyl group or tetrahydrogeranyl group on C-6. The majority of inhibitors were shown to have IC50 values of 10  $\mu$ M or below. Interesting, compound 7 emerged as the best inhibitor with an IC50 of 6 nM, more than 2000-fold increase in activity relative to that of parent compound, eriodictyol (IC50 = 15  $\mu$ M). The detailed kinetic analysis of the species has unveiled that they are all competitive, slow binding inhibitor. Such characteristics are highly unusual for flavonoids obtained from natural source. Compound 1 showed the simple reversible slow binding model ( $k_3 = 0.00036 \mu\text{M}^{-1} \text{min}^{-1}$ ,  $k_4 = 0.016 \text{min}$ , and  $k_{i \text{ app}} = 44.0 \text{nM}$ ) against neuraminidase. PrePrint: c-geranyl\_flavonoids\_from\_paulownia\_tomentosa\_fruits\_displaying\_potent\_neuraminidase\_inhibition.pdf

**19240 Inhibition effects on  $\beta$ -glucosidase by xanthenes from the fruit barks of *Garcinia mangostana*** 1. Gyeongsang Natl Univ, Div of Applied Life Science, Jinju, Gyeongnam, Republic of Korea 2. Nat'l Institute of Crop Science, Milyang, Gyeongnam, Republic of Korea 1. KyeongYeol Oh1 sejarri@hanmail.net 2. Sunin Jung1 , sun-in18@hanmail.net 3. HyungWon Ryu1 , fbguddnjs@hanmail.net 4. ByeongWon Lee2, bwlee@korea.kr 5. KiChang Jang2 , kcjang72@rda.go.kr 6. KiHun Park1 , khpark@gnu.ac.kr Eleven xanthenes (1-12) displaying  $\beta$ -glucosidase were isolated from the fruit barks of *Garcinia mangostana* which has been known as good natural source for anticancer effect and antiinflammatory activity in basis of antioxidative properties. Dimeric xanthone 12 emerged to be new compound which we fully spectroscopically characterized. The IC50 values of compounds (1-12) for  $\beta$ -glucosidase inhibition were determined to range between 1.5 and 34.2  $\mu$ M. Our studies reveal that IC50 has a marked dependence upon structure in case of 6,7-vicinal dihydroxy xanthenes. Compounds (2-4), which have one of these hydroxyl group methylated were less effective (5.0-29.9  $\mu$ M), whereas 6,7-vicinal dihydroxy xanthone 1 showed an IC50 value of 1.5  $\mu$ M. Moreover, 6,7-vicinal dihydroxy xanthone showed better inhibition than 5,8-dihydroxy xanthenes (8 and 11, IC50 = 6.9-10.8  $\mu$ M) for  $\beta$ -glucosidase inhibition. Kinetic analysis disclosed that all inhibitors are mixed type.

**19601 Andrographolide-induced Pi class of glutathione S-transferase gene expression via PI3K/Akt pathway in rat primary hepatocytes** 1. Chung Shan Medical U, School of Nutrition, Taichung, Taiwan Rep of China. 1. Chia- Yang Lu1 annlu24405@hotmail.com 2. Kai-Li Liu1 , 3. Haw-Wen Chen2 *Andrographis paniculata* (Burm. f) Nees is a widely used herb in China, Korea and India for its antihepatotoxic, anti-virus, and anti-inflammation effects. Andrographolide (Ap) is a major bioactive diterpene lactone in *Andrographis paniculata*. Pi class of glutathione S-transferase (PGST) is one of the phase II biotransformation enzymes. The aim of this study is to investigate the mechanism by which Ap induces PGST gene expression in rat primary hepatocytes. Hepatocytes treated with 40  $\mu$ M Ap shows a maximal Akt phosphorylation at 30 mins, and a maximal c-jun phosphorylation at 3 h. However, pretreatment with inhibitors of PI3K, wortmannin (Wt) or LY294002 (LY), inhibits Ap-induced phosphorylation of Akt and c-jun. Meanwhile, pretreatment with Wt or LY inhibits the activation of AP-1- DNA binding activity by Ap. In summary, Ap-induced PGST gene expression may be through phosphorylation of Akt and c-jun, and subsequent binding to the response element in the gene promoter region in rat primary hepatocytes.

**18201 Evaluation of *Centaurea americana* as a potential biodiesel oilseed crop** 1. Southeastern Oklahoma State University, Department of Chemistry, Computer & Physical Sciences, Durant, OK, 1. Nancy L. Paiva1 , nlpaiva@alum.mit.edu 2. Dale W. Daniel1 , 3. Anthony Banks1 , 4. Kelli Baze Fulks1 , 5. Tucker Harrison1 , 6. Jeff B. Hill1 , 7. Kati Crawford1 , 8. Michael C. Pilkington1 , *Centaurea americana* (American basket flower) is a native Oklahoma wildflower which produces numerous thin-shelled, oil-rich seeds. GC-MS fatty acid methyl

ester (FAME) analysis of 50/50 chloroform/MeOH extracts from bulk seed samples revealed that the major fatty acids were linoleic (C18:2; 50-55%) and oleic (C18:1; 30-35%), with lower amounts of palmitic (C16:0; 9-10%) and stearic (C18:0; 3%) and traces of arachidic and linolenic acids. Roughly 17%(w/w) of hexane-extractable triacylglyceride oil was obtained from commercial seeds. The fatty acid profile of Centaurea oil is very similar to soybean and corn oils, and therefore could be an excellent alternative feedstock for biodiesel fuel production. Current efforts are investigating possible causes of small variations in oil composition (genetic versus environmental differences), estimating yields of seeds and oil per acre, and identifying profitable uses for extracted seed meal and natural products. (Funded by OCAST Applied Plant Science Grant #PSA08-03 and NASA Oklahoma Space Grant Consortium.)

**15730 Development of a Luminex® immunoassay for simultaneous detection of Shiga toxins and Escherichia coli O157 in ground beef** 1. USDA - Agricultural Research Service - Western Regional Research Center, Foodborne Contaminants Research Unit, Albany, CA, 2. FDA, San Francisco District Laboratory, Alameda, CA, 1. Clay Bernard IV1, clay.bernard@ars.usda.gov 2. Myriam K Lonhienne1, 3. Gary L Hartman2, 4. David K Lau2, 5. John M Carter1, 6. Laurie M Clotilde1, Shiga toxin-producing Escherichia coli (STEC) are costly foodborne pathogens. As the global prevalence of STEC in beef products ranges from 0.01% to 62.5%, there is a need for developing a rapid screening assay. Here, we developed a Luminex immunoassay to screen for Shiga toxin 1 (Stx1), Shiga toxin 2, and E. coli O157 lipopolysaccharides (O157 LPS) simultaneously in ground beef. Using minimal sample preparation, we tested ground beef samples spiked with < 50 CFU of STEC organisms for Stx1, Stx2, and O157 LPS. We were able to detect the three analytes simultaneously and our results showed the same specificity and sensitivity as ones obtained from testing pure STEC cultures. Also testing for these analytes by conventional sandwich ELISA did not work. Thus, our assay could serve as a milestone for developing a multiplex assay for foodborne pathogens as the Luminex technology has 100 microbeads regions that can be used simultaneously.

**16475 Determination of steviol glycosides in sugar substitutes by HPLC-UV and - ELS detection** 1. Dionex Corporation, Sunnyvale, CA, 1. Deanna C. Hurum1, Dionex Corporation, Applications Laboratory, Sunnyvale, CA deanna.hurum@dionex.com 2. Brian M. De Borba1, 3. Deepali Mohindra1, 4. Jeffrey S. Rohrer1, Extracts of Stevia rebaudiana (Bertoni) are gaining popularity as non-caloric sweeteners and have been commercialized as sugar substitutes. Two glycosides, stevioside and rebaudioside A, are of primary interest because they taste 300-400 times sweeter than sucrose. Using a mixed-mode weak anion exchange column, we developed an isocratic method based on the Joint European Expert Committee on Food Additives (JECFA) monograph for the analysis of stevia extracts. This method was expanded to determine the relative proportion of glycosides in two commercial stevia-based sweeteners. Brand A was composed of 53% stevioside and 35% rebaudioside A by UV. Brand B was composed of >99.9% rebaudioside A. Quantification of rebaudioside A and stevioside is consistent by both detection methods. Retention time precision (n=7) and peak area precision had RSDs of < 0.1 and < 2.0, respectively for commercially available products. Recoveries ranged from 90.6-104%, suggesting method accuracy

**15160 Aromatic herb phenolic content and iron source effects of off-color “specks” developed in the cooking of iron fortified pasta** 1. Agrarian National University La Molina, Graduate School, Lima, Lima 12, Peru 1. César R Villalobos1, cevillalobos@yahoo.com 2. Patricia Glorio1, pgg@lamolina.edu.pe Aromatic herbs such as oregano, rosemary and spearmint among others are common ingredients during the cooking of iron fortified pasta in ethnic cuisine, where off-color development can discourage its consumption. When wheat flour fortified laminar pasta was evaluated, no significant differences in the number of specks were found over the control when EDTA Fe (III) added previously dissolved, ferric pyrophosphate or ferric orthophosphate. The lowest diameter of specks was for reduced iron and the highest for EDTA Fe (III) solid added which also showed the lowest  $\Delta E$  (intensity) and higher lightness, calculated over  $L^*$ ,  $a^*$ ,  $b^*$  chromatic parameters determined over photo captured and software analyzed images. The lowest darkness and higher  $\Delta E$  was shown by ferrous fumarate fortified pasta. Herbs phenolic content (36.5 to 1682.7 mg Gallic acid/100g) was linear with  $\Delta E$  ( $r = + 0.844$ ) and  $L^*$  ( $r = - 0.709$ ). Salinity and pH 6.5 favored specks, but pH 4 reversed it

**12393 Accumulation of methylglyoxal leads to growth arrest in glutathione-deficient cells of Dictyostelium discoideum** 1. Seoul National University, Laboratory of Biophysics, School of Biological Science, Gwanak-gu, Seoul, Republic of Korea 2. 1. Seong-Jun Park1,2, maroo45@snu.ac.kr 2. Sa-Ouk Kang1,2, Kangsaou@snu.ac.kr In Dictyostelium discoideum, the null mutant ( $gcsA^-$ ) of  $gcsA$  encoding  $\gamma$ -glutamylcysteine synthetase shows growth arrest and developmental defect when GSH is depleted. To investigate the mechanism by which GSH depletion induces growth arrest, a proteomic analysis was performed and aldose reductase (AlrA) was identified as the most prominently induced protein in  $gcsA^-$  cells. Induction of AlrA was dependent on GSH concentration and was repressed by only GSH Methylglyoxal (MG), a toxic  $\alpha$ -ketoaldehyde, strongly induced alrA expression and AlrA catalyzed MG reduction efficiently. The alrA knockdown  $gcsA^-$  cells ( $gcsA^-/alrAas$ ) exhibited more decreased growth rate than  $gcsA^-$  cells whereas the  $gcsA^-$  cells overexpressing alrA ( $gcsA^-/alrAoe$ ) restored the defective growth of  $gcsA^-$  cells. Interestingly, intracellular MG levels were significantly augmented in  $gcsA^-/alrAas$  cells compared to  $gcsA^-$  cells following GSH depletion. By contrast,  $gcsA^-/alrAoe$  cells showed repression of MG induction. Furthermore, MG treatment inhibited growth of wild-type KAX3 cells, inducing G1 phase arrest. Cyclin ( $cyc$ ) has been known cell cycle regulation factor. To address what kind of cell cycle factors induces growth arrest of Dictyostelium, we performed a cyclin mRNA analysis to see the difference in transcriptional expression patterns between  $gcsA^-$  and treated with MG using Northern blot analysis and real-time PCR. We revealed that transcriptional level of cyclin A ( $cycA$ ) and cyclin B ( $cycB$ ) were changed by GSH depletion and MG treatment.

## WEDNESDAY MORNING March 24 Section A

### Recent Developments in Food-related Nanotechnology

Bosoon Park, James Oxley, Michael Appell, Evangelyn Alocilja, Organizers, Presiding 8:30 Introductory Remarks.

8:35 224. Entrapment of organic fluorescent dyes into nano-sized silica particles and their application to biomarker detection. S.-M. Oh, C.-T. Kim, Y.-J. Cho, N. Kim

9:00 225. Characterization of novel surfaces by FTIR spectroscopy and Atomic Force Microscopy for food pathogen detection. S. Hawkins, B. Park, P. J. Amini, G. Chen, B. Xu

9:25 226. Detection of pathogens and toxins by surface enhanced Raman spectroscopy using silver nanorods array substrates. Y.-W. Huang, Y. Zhao, B. Park  
9:50 227. Gold nanomaterial based sensing of food toxin. P. C. Ray  
10:15 Intermission.  
10:30 228. Evidence review and experts' opinion on consumer acceptance of agrifood nanotechnology. R. M. Yawson, J. Kuzma  
10:55 229. Perceptions of food-related nanotechnologies: European and US views. M. Buecking, B. Seidel, E. Alocilja  
11:20 230. Nanoparticle impact on plants and plant-associated microbes. A. Anderson, C. Dimkpa, J. McLean, D. Britt, W. Johnson

**WM2 Entrapment of organic fluorescent dyes into nano-sized silica particles and their application to biomarker detection** 1. Korea Food Research Institute, Food Bio-nano Technology Research Group, Songnam-Si, Kyonggi-Do, Republic of Korea 1. Sun-Mi Oh<sup>2</sup>, 2. Chong-Tai Kim<sup>2</sup>, 3. Yong-Jin Cho<sup>2</sup>, 4. Namsoo Kim<sup>2</sup>, Songnam-Si, Kyonggi-Do, @hanmail.net The entrapment of organic fluorescent dyes comprising dichlorotris(1,10-phenanthroline)ruthenium(II) (Ruphen) and 5(6)-carboxymethylrhodamine into nano-sized silica particles were tried and the resulting nanoparticles were examined for their appearance, spectral and fluorescence emission properties by particle size analysis, scanning electron microscopy and fluorescence microscopy. Out of the tested dyes, Ruphen was only found to be entrapped into the silica matrix. The yield, particle size and shape were strongly dependent upon the contents of dye, ammonium hydroxide and tetraethylorthosilicate. Compared to free dye, the silica particles entrapped with Ruphen showed conspicuous higher fluorescence intensity, which seemed to make them suited for an antibody labeling for high sensitivity biomarker detection. By using a glass slide-based indirect-competitive immunosensing protocol exploiting the nano-sized silica particles, we were able to detect C-reactive protein which is an important biomarker for coronary disease, hypertension and inflammation with the limit of detection around 1 ng/mL after a process optimization. This study was carried out as one part (E090302) of the research project of Development of Food Nanotechnology, Korea Food Research Institute, Republic of Korea.

**WM3 Characterization of novel surfaces by FTIR spectroscopy and Atomic Force Microscopy for food pathogen detection** 1. US Department of Agriculture-Agricultural Research Services, Athens, GA, 2. Washington University, St. Louis, MO, 3. University of Georgia, Athens, GA, 1. Samantha Hawkins<sup>1</sup> samantha.hawkins@ars.usda.gov 2. Bosoon Park<sup>1</sup>, bosoon.park@ars.usda.gov 3. P.J. Amini<sup>2</sup>, 4. Guojun Chen<sup>3</sup>, 5. Bingqian Xu<sup>3</sup>, Single molecular detection of pathogens and toxins of interest to food safety is within grasp using technology such as AFM. Using antibodies or aptamers connected to the AFM tip make it possible to detect a pathogen on a surface. However, it also becomes necessary to trap that pathogen on the surface. This can be carried out using linker molecules with a high affinity for chemical reaction with the pathogen. FTIR spectroscopy, along with AFM, has been used to study the surface characterization of certain linker molecules on a gold surface. A self assembled monolayer of DSP was formed on the surface and NTA was then added to the surface to form a DSP-NTA linker. A different SAM of DSP-NTA was formed where the DSP and NTA had already reacted prior to being added to the surface. Both FTIR and AFM confirm that the order of addition of the linker to the surface affect the orientation and coverage of the linker molecule on the gold surface. This will affect the ability of the linker to effectively capture proteins on the surface for analysis.

**WM4 Detection of pathogens and toxins by surface enhanced Raman spectroscopy using silver nanorods array substrates** 1. University of Georgia, Department of Food Science and Technology, Athens, GA, 2. University of Georgia, Department of Physics and Astronomy, Athens, GA, 3. United State Department of Agriculture, Agricultural Research Service, Athens, GA, 1. Yao-wen Huang<sup>1</sup>, huang188@gmail.com 2. Yiping Zhao<sup>2</sup>, zhaoy@physast.uga.edu 3. Bosoon Park<sup>3</sup>, bosoon.park@ars.usda.gov Surface enhanced Raman spectroscopy offers considerable potential in the area of molecular identification and trace element analysis, which has significant applications in both biological and chemical analysis. We have created a portable SERS probe which can be easily incorporated with a fiber Raman system. We demonstrated the concentration dependency of Raman intensities on the oblique angle deposition (OAD) fabricated silver nanorod array using BPE as a molecular probe and observed a sensitivity of 14 attomole for BPE. The nanorod substrates were optimized by varying the length, the density and tilting angle of the Ag nanorod arrays by changing the fabrication conditions. The deposition angle will change from 45° to 87°. We have developed a SERS probe that integrated into a fiber Raman system for in situ measurements and act as a portable and remote sensor for accurate and rapid real-time SERS measurements. To test the substrates, we used Escherichia coli and Salmonella typhimurium. The substrate that gives the highest sensitivity and signal-to-noise ratio was optimized.

**WM5 Gold nanomaterial based sensing of food toxin** 1. Jackson State University, Chemistry, Jackson, MS 1. Paresh Chandra Ray<sup>1</sup> paresh.c.ray@jsums.edu Food pollution caused by biological and chemical toxin contamination is a serious problem in real life. Human infection becoming very common due to the traced amount of biological and chemical toxin to poultry, dried or frozen eggs, dairy products, shellfish and also from contaminated water. Detection of bacterial and toxic metals like As and Hg, from contamination of food, therefore, is very important for public health protection. In spite of the real need for obtaining analytical results in the shortest time possible, traditional and standard detection methods may take up to 7 or 8 days to yield an answer. Here we will discuss our recent effort on focused on the detection of different food toxin like, Salmonella bacteria, mercury and Arsenic, using gold nanomaterial based different types colorimetric as well as sactering assay, which has excellent sensitivity and selectivity, which are difficult to achieve by conventional methods. Given the simplicity, speed, and sensitivity of this approach, the described methodology could easily be extended to a high throughput format and become a new method of choice in all applications that require an assay for food toxin detection.

**WM7 Evidence review and experts' opinion on consumer acceptance of agrifood nanotechnology** 1. University of Minnesota, Center for Science, Technology and Public Policy, Hubert H. Humphrey Institute of Public Affairs, Minneapolis, MN, 1. Robert M Yawson<sup>1</sup>, yawso003@umn.edu 2. Jennifer Kuzma<sup>1</sup>, Nanotechnology is becoming increasingly important for the food sector, and advances are already being made in the areas of food packaging and food safety. However, there are several potential barriers to the commercialization of agrifood

nanotechnology products that may limit the ability to capture its full potential. Consumer acceptance is dependent on the specific needs of consumers which are likely to be key in determining the success or otherwise of agrifood nanotechnology commercialization. Factors that may influence consumer acceptance of agrifood nanotechnology were studied using evidence review of literature and elicitation of experts' opinion. Public attitudes and perceptions, and consumer acceptance; regulatory uncertainty; and, health and safety are the most identified barriers in the literature and the results obtained from the value elicitation from experts compares favorably with evidence from the literature. The study concludes that perceived risks and perceived benefits are the most important factors in consumer acceptance of agrifood nanotechnology products.

**WM8 Perceptions of food-related nanotechnologies: European and US views** 1. Fraunhofer Institute for Molecular Biology and Applied Ecology IME, Fraunhofer Alliance Food Chain Management, Auf dem Aberg 1, Schmallenberg-Grafschaft, North Rhine Westphalia, Germany 2. Michigan State University, Biosystems and Agricultural Engineering, East Lansing, Michigan, 1. Mark Buecking1, Mark.Buecking@ime.fraunhofer.de 2. Bjoern Seidel1, bjoern.seidel@ime.fraunhofer.de 3. Evangelyn Alocilja2, Michigan, alocilja@msu.edu The European food industry has a vital interest in food-related technology. However, the European consumers are not sure of its health effects. On average, only 50% of the European citizens have a positive opinion. The European authority was requested in 2008 to identify the nature of the possible hazards associated with actual and foreseen applications in the food and feed area. In the US however, the perception on the health or environmental risks and benefits of nanotechnology is enmeshed in a complex decision-making process. In a recent survey, the perceived benefits on the use of nanotechnology applications is more pronounced when risks were lower than when risks were high. For instance, when the benefits are low, consumers are more concerned about risks than when benefits are high. This paper will present studies on the public perception of food and feed-related nanotechnologies in light of the European and US views.

**WM9 Nanoparticle impact on plants and plant-associated microbes** 1. Utah State Univ., Biology, Logan, Utah, 2. Univ. of Utah, Geology, Salt Lake City, Ut 3. Utah State Univ., Biological Eng, 1. Anne Anderson1, anderson@biology.usu.edu 2. Christian Dimkpa1, 3. Joan McLean3, 4. David Britt3, 5. William Johnson2. Commercial production of certain nanoparticles is fueled in part by applications as antimicrobial, antitumor and diagnostic agents in the medical field. Our work focuses on three metal-containing nanoparticles, Ag, CuO and ZnO, which have well established antimicrobial activities against human pathogenic bacteria. These nanoparticles alter the metabolism of plant root-colonizing pseudomonads but with differential effects on culturability. The environmental strain, *Pseudomonas chlororaphis* O6, has more resilience to the antimicrobial activities of CuO and ZnO nanoparticles compared with the pathogenic *Escherichia coli* strains. When the CuO nanoparticles were included in the growth matrix for wheat seeds, impaired root growth was observed and correlated with increased lipid peroxidation. Elevated levels of Cu in the shoots were detected that were similar to the burden imposed by growth in 10 mg/L Cu ion. Thus, the Cu in the CuO nanoparticles was bioavailable for the wheat seedlings under these growth conditions.

## **WEDNESDAY MORNING March 24 Section B**

### **General Papers**

Michael Appell, Organizer Gavin Sacks, Perry Wang, Presiding

8:15 Introductory Remarks.

8:20 231. Acrylamide in bread precursors: Formation and reduction. A. Mustafa

8:45 232. Influence of roasting condition, color and precursors on the acrylamide formation during almonds roasting. G. Zhang, A. E. Mitchell

9:10 233. Determination of lactose in lactose-free products by high-performance anion-exchange chromatography with electrochemical detection. P. R. Perati, J. S. Rohrer

9:35 234. Bioactive compounds from okra seed: Potential inhibitors of advanced glycation end products (AGEs). B. Dayal, M. Lea, N. H. Ertel

10:00 Intermission.

10:15 235. Extraction efficiency of carotenoids and their antioxidant activity. G. K. Jayaprakasha, B. S. Patil

10:40 236. Antioxidant and chemopreventive activity of trans-resveratrol-3-O- $\beta$ -D-glycoside depends on metabolite formation and on their pharmacokinetics. A. Burkon, K. Koen van de Wetering, W. Feddema, A. Bot, H. de Jonge, P. Borst, V. Somoza

11:05 237. Polyphenol and antioxidant contents of fruits consumed by migratory birds in southern New England. J. Bolser, L. Li, S. McWilliams, N. P. Seeram

11:30 238. Fluorometric assay for pro-oxidant activity of dietary polyphenolics and teas under physiological conditions. D. Huang, Y. L. Quek, W. Chin, Y. Y. Tan

**WM2 Acrylamide in bread precursors: Formation and reduction** 2. Swedish University of Agricultural Sciences, Department of Food Science, Uppsala, Sweden 1. Arwa Mustafa2, Food Science, Uppsala, Sweden Arwa.Mustafa@kemi.uu.se Acrylamide is found at concentrations up to a few mg/kg, mainly carbohydrate-rich foods subjected to high thermal processing. Acrylamide is formed in foods via the Maillard reaction with free asparagine and reducing sugars as the precursors, with the former generally being limiting in cereal products. Asparagine was the major free amino acids in the cereals analysed. A major decrease in asparagine was found to occur during yeast fermentation. The content of acrylamide in crispbread was found to be mainly controlled by the time and temperature of baking and the level of asparagine present. Studies on interactions between added asparagine, glycine and fermentation time on the formation of acrylamide in soft wheat bread showed that fermentation time has a reducing effect on acrylamide formation, which was governed by the level of asparagine present in the system. Glycine addition significantly decreased acrylamide depending on the initial levels of asparagine in the dough, and increased the colour intensity of the bread.

**WM3 Influence of roasting condition, color and precursors on the acrylamide formation during almonds roasting** 1. University of California, Davis, Food Science, Davis, CA, 1. Gong Zhang<sup>1</sup> gonzhang@ucdavis.edu 2. Alyson E. Mitchell<sup>1</sup>, The major factors involved in the formation of the carcinogen acrylamide in roasted almonds were investigated. The main factors assessed include: roasting time and temperature, color, glucose and fructose and asparagine and glutamine content. The influence of precursors, cultivar, growing region and harvest year, from three orchards in California were roasted and evaluated. Roasting time and temperature combinations strongly influence the formation of acrylamide and high correlation was found between time and acrylamide levels at individual temperatures ( $R^2=0.715-0.989$ ). Acrylamide levels ranged between 109 mg/kg (L. Butte) to 287 mg/kg (L. Monterey) with an average of 188 mg/kg. Roasting at 146 °C for less than 22 min minimizes acrylamide formation. Asparagine levels in raw almonds correlate strongly with acrylamide formation ( $R^2=0.6787$ ); the reducing sugars and glutamine are not limiting factors. No relation was found between acrylamide and harvest year, growing region and cultivar but the asparagine content.

**WM4 Determination of lactose in lactose free products by high-performance anion-exchange chromatography with electrochemical detection** 1. Dionex Corporation, Applications Marketing, Sunnyvale, CA, 1. Pranathi R Perati<sup>1</sup>, pranathi.perati@dionex.com 2. Jeffrey S Rohrer<sup>1</sup>: Lactose is the major disaccharide found in milk products, and is catabolized into glucose and galactose by the enzyme lactase. Lactose intolerant individuals have a lactase deficiency, and therefore lactose is not completely catabolized. While lactose intolerance is not a dangerous condition, its global and ethnic prevalence has created a large market for lactose-free products. The fact that these products vary considerably in residual lactose content has created the need for simple, reliable, and accurate analytical methods to quantify lactose. This paper describes a sensitive and accurate method to determine lactose and lactulose in dairy products, including lactose-free products, using a strong anion-exchange column designed for high-resolution separations of carbohydrates, and electrochemical detection. This method was used to determine lactose levels in six different commercially available products; four of which were lactose-free products. Lactose-free Gouda and Havarti cheeses had no detectable lactose, and lactose-free milk and cottage cheese had 2.9 mg/mL and 0.58 mg/mL of lactose respectively. Spike recoveries for lactose and lactulose ranged from 99±6% to 104±4%, depending on the matrix used, suggesting method accuracy.

**WM5 Bioactive compounds from okra seed: Potential inhibitors of advanced glycation end products (AGEs)** 1. UMD-New Jersey Medical School, Department of Medicine, Newark, New Jersey, 1. Bishambar Dayal<sup>1</sup>, dayalbi@umdnj.edu 2. Michael Lea<sup>1</sup> UMD-New Jersey Medical school, Biochemistry and Molecular biology, Newark, New Jersey, lea@umdnj.edu 3. Norman H Ertel<sup>1</sup>, ertel@umdnj.edu Glycoxidation products (CMLs, protein cross-links, antigenic AGEs and pentosidine) accumulate irreversibly in proteins during the Maillard reaction. Oxygen radicals are implicated in this Maillard reaction damage to proteins. Such advanced glycation end products accumulate in proteins with age and at an increased rate in both type-2 diabetes and cardiovascular disease. Recent studies have indicated that a high fat diet supplemented with flavonoid may reverse the progression of diabetes and heart disease. In the present study flavonoid compounds from okra seed were examined to see their beneficial inhibitory effects on AGEs. After microwave-assisted methanolic solvent extraction we isolated and characterized via HPLC-ESI-MS (-ve mode) five major antioxidant components in Okra seed. These compounds were flavonoids with different sugar moieties and all had the same aglycone, quercetin corresponding to common peak at m/z 301. The ESI-MS mass spectra exhibited the ion [M-H]<sup>-</sup> at 433 corresponding to 3,5,7, 3', 4'-pentahydroxy-3-O-?-L-arabinofuranoside, [M-H]<sup>-</sup> at 447 (kempferol-3-O-glucoside), [M-H]<sup>-</sup> at 463 (Quercetin-3-O-glucoside), [M-H]<sup>-</sup> at 609 (quercetin-3-O-rutinoside), [M-H]<sup>-</sup> at 625 (Quercetin-3-O-diglucoside). Since in diabetes patients hyperglycemia results in the non-enzymatic glycation of many proteins, a basal level of HDL apolipoprotein A-1 glycation occurs in normal individuals. But there is a nearly 400% increase in the level of HDL-apoA-1 glycation in diabetic patients (Dayal, Ertel et al. J Proteome Res. 1:375, 2002). The level of glycation has been positively correlated with the degree of hyperglycemia and such a functional abnormality in HDL-apoA-1 is responsible for the accelerated development of atherosclerosis in diabetic patients. We believe the Kampferol-3-O-monoglucoside and pentahydroxy-3-O-?-L-arabinofuranoside and other flavonoids which are highly potent antioxidants may inhibit the AGEs.

**WM7 Extraction efficiency of carotenoids and their antioxidant activity** 1. Texas A&M U., Horticultural Sciences, Vegetable & Fruit Improvement Center, College Station, Texas, 1. G.K. Jayaprakasha<sup>1</sup>, gjayaprakasha@ag.tamu.edu 2. Bhimanagouda S. Patil<sup>1</sup> Fruits and vegetables containing vitamin C, vitamin E (tocopherols), and carotenoids (α-carotene, β-carotene, β-cryptoxanthin, lutein, zeaxanthin, and lycopene) have been suggested as a natural source of antioxidants. Carotenoids, being the principal pigments responsible for color, are also the most important aspects of fruit external quality. Carotenoids play multiple roles in maintaining human health such as disease prevention, scavenging the free radicals, diminished lipid peroxidation and immune enhancement. It was reported that the global market demand for carotenoids has been growing at 2.9% per annum and is expected to reach \$1.02 billion by 2009. However, most of the carotenoids sold in the market are derived from chemical synthesis. Therefore, extraction optimization and quantification of carotenoids from natural sources is critical. Reports indicated that approximately 60% of the analysis time is spent on sample preparation and that approximately 30% of analytical error stems from sample preparation step. It is essential to develop a systematic sample preparation procedure for optimum extraction and accurate quantization of carotenoids in different matrices. In the present study, carotenoids were extracted from tomatoes, red peppers, papaya, mango, watermelon, carrots and oranges using five solvents of variable polarities. The extracts were analyzed by HPLC using diode array detector with gradient mobile phases such as tert butyl methyl ether and acetonitrile. α-Carotene, β-carotene and lycopene were quantified. The present study demonstrated that, extraction of carotenoids depends upon the nature of the food matrix. The main advantage of this method is the absence of concentration/evaporation step. Finally, these extracts were tested for the radical scavenging activity using DPPH method. The activity is well correlated with carotenoids concentration. These results are based on the work supported by the USDA-CSREES # 2009-34402-19831 "Designing Foods for Health" through the Vegetable & Fruit Improvement Center.

**WM8 Antioxidant and chemopreventive activity of trans-resveratrol-3-O-?-D-glycoside depends on metabolite formation and on their pharmacokinetics** 1. German Res Center for Food Chemistry, Garching, Germany 2. The Netherlands Cancer Inst, Div of Molecular Biology, Amsterdam, The Netherlands 3. Erasmus University Medical Center, Department of Biochemistry, Rotterdam, The Netherlands 1. Alexander Burkon<sup>1</sup>, 2. Koen Koen van de Wetering<sup>2</sup>, 3. Wouter Feddema<sup>2</sup>, 4. Alice Bot<sup>3</sup>, 5. Hugo de Jonge<sup>3</sup>, 6. Piet Borst<sup>2</sup>, 7. Veronika Somojai<sup>1</sup>, University of Vienna, Research Platform Molecular Food Science, Althanstrasse 14 Vienna, A-1090,

Austria, veronika.somoza@univie.ac.at After a single oral administration of 85.5 mg trans-resveratrol-3-O- $\beta$ -D-glycoside (piceid) per 70 kg bw to nine healthy volunteers, the metabolites resveratrol-3-sulfate, resveratrol-3,4'-disulfate, resveratrol-3,5-disulfate, resveratrol-3-glucuronide and resveratrol-4'-glucuronide were identified and quantified in plasma and urine by LC-MS/MS using synthesized reference compounds the structure of which was confirmed by NMR experiments. Furthermore, two novel resveratrol-C/O-conjugated diglucuronides were identified, synthesized and quantified. Sulfate conjugates were quantitatively dominating in urine and plasma samples. Results from animal experiments on knock-out mice revealed selective transport mechanisms of sulfate and glucuronide conjugates via the transport proteins BCRP/Bcrp1 and MRP3/Mrp3. Antioxidant and chemopreventive effects of the resveratrol metabolites identified revealed a structure dependent activity, with the number of free hydroxyl groups determining their efficacy. However, an antioxidant effect for orally administered piceid was also demonstrated in the human intervention trial, indicated by increased catalytic activities of superoxide dismutase and decreased contents of conjugated fatty acid dienes in erythrocytes.

**WM9 Polyphenol and antioxidant contents of fruits consumed by migratory birds in southern New England** 1. Bioactive Botanical Research Laboratory, Biomedical and Pharmaceutical Sciences, College of Pharmacy, University of Rhode Island, Kingston, RI, 2. Department of Natural Resources Science, College of Environmental and Life Sciences, University of Rhode Island, Kingston, RI 1. Jessica Bolser<sup>2</sup>, 2. Liya Li<sup>1</sup>, 3. Scott McWilliams<sup>2</sup>, 4. Navindra P. Seeram<sup>1</sup>, nseeram@mail.uri.edu Many species of migratory birds switch their diets during autumn migration to consume larger amounts of fruits than insects. It is thought that migratory birds may select fruits for their phytochemicals, such as polyphenols (including anthocyanins), to potentially combat oxidative stress induced during long flights. As part of an ongoing study to examine determinants of fruit selection by birds during fall migration, twelve commonly available fruit species were collected at peak-ripeness from Block Island (Rhode Island, USA), an important stopover site for migratory birds in southern New England. To evaluate the hypothesis that fruit selection by birds is related to availability of dietary phenolic antioxidants, we measured total polyphenol (Folin-Ciocalteu method as gallic acid equivalents, GAEs), total anthocyanin (by pH differential method as cyanidin-3-glucoside equivalents, CYDs) and antioxidant capacity (ability to scavenge diphenylpicrylhydrazyl, DPPH, free radical). Fruits included southern and northern arrowwood (*Viburnum dentatum*, *V. recognitum*, respectively), winterberry (*Ilex verticillata*), northern bayberry (*Myrica pennsylvanica*), black, purple, and red chokeberry (*Aronia melanocarpa*, *A. prunifolia*, *A. arbutifolia*, respectively), American pokeweed (*Phytolacca americana*), Oriental bittersweet (*Celastrus orbiculatus*), multiflora rose (*Rosa multiflora*), Virginia creeper (*Parthenocissus quinquefolia*), and American elderberry (*Sambucus canadensis*). Among these, the *Viburnum* species were the fruit with the highest bird consumption. Further, the *Viburnum* species had the highest polyphenol and anthocyanin (ca. 25% GAEs and 7% CYDs, respectively) contents and antioxidant capacity (IC<sub>50</sub> ca. 60 $\mu$ g/mL). These results support the hypothesis that some migratory birds may actively select polyphenol/anthocyanin rich fruits as a foraging signal for anthocyanin antioxidant rewards.

**WM10 Fluorometric assay for pro-oxidant activity of dietary polyphenolics and teas under physiological conditions** 1. National University of Singapore, Department of Chemistry, Singapore, 1. Dejian Huang<sup>1</sup> chmhdj@nus.edu.sg 2. Yi Ling Quek<sup>1</sup>, 3. Wenie Chin<sup>1</sup>, 4. Ying Ying Tan<sup>1</sup>. Non-fluorescent hydroethidine (HE) reacts with myricetin to cleanly form highly fluorescent ethidium cation (E<sup>+</sup>) instead of 2-hydroxyethidium cation (2-OH-E<sup>+</sup>) at pH 7.40 buffer and 37 °C. The reaction is completely inhibited by superoxide dismutase (SOD) indicating involvement of superoxide anion. Reaction between potassium superoxide (KO<sub>2</sub>) with HE showed that in the presence of flavonol (myricetin, quercetin), the reaction product is solely E<sup>+</sup>, whereas in the absence of flavonol, the products are mainly 2-OH-E<sup>+</sup> with small amount of E<sup>+</sup>. The aerial oxidation of HE by flavonol obeys first order kinetics with respect to flavonol concentration and the rate constant was measured as pro-oxidant activity of a given flavonol. The superoxide generation activity follows the order of myricetin > quercetin > kaempferol. This approach was used to measure superoxide generation activity of teas. The black teas has much stronger pro-oxidant activity comparing to red and green tea.

## WEDNESDAY MORNING March 24 Section C

### Biocatalysis for Biofuels and Bioproducts Lignocellulosics

(Cosponsors: Div of Cellulose & Renewable Materials, Div of Agrochemicals, Chemistry for a Sustainable World)  
Dominic Wong, Joseph Laszlo, Organizer, Presiding

8:30 239. Engineered enzyme complexes for conversion of cellulosic biomass to fuels and chemicals. C. Paavola, S. Mitsuzawa, H. Kagawa, S. Chan, N. Dvorochkin, E. Almeida, O. Marcu, S. Bhattacharya, S. Reinsch, Y. Li, J. Trent

8:55 240. Structure-function relationships in the sub-domains of the Family 7 cellulase from *Trichoderma reesei*. G. T. Beckham, W. S. Adney, J. F. Matthews, J. Yarbrough, M. R. Nimlos, M. E. Himmel, M. F. Crowley

9:20 241. Understanding cellobiohydrolase processivity: Computational study of underlying mechanisms. M. F. Crowley, G. T. Beckham, L. Bu, M. R. Nimlos, W. S. Adney, M. E. Himmel

9:45 242. Development of cell surface engineering (arming technology) in the design of revolutionary whole-cell biocatalyst for lignocellulose utilization. M. Ueda

10:10 Intermission.

10:25 243. Effects of cultivation media on bacterial communities and performance of microbial fuel cells. S. Xu, H. Liu

10:50 244. Industrial applications of castor oil and the castor plant. T. A. McKeon

11:15 245. Robust yeast biocatalyst for cellulosic ethanol production. P. Suominen, G. Folkert, H. Jessen, L. Dierickx, B. Mastel, J. Lundorff, A. Negrete-Raymond, G. Poynter, B. Rush, K. Finley

11:40 Concluding Remarks.

**WM1 Engineered enzyme complexes for conversion of cellulosic biomass to fuels and chemicals** 1. NASA Ames Research Center, Moffett Field, CA, 2. SETI Institute, Mountain View, CA, 3. University Space Research Association, Houston, TX, 4. University of California, Santa Cruz, Department of Biomolecular Engineering, Santa Cruz, CA, 1. Chad Paavola<sup>1</sup>, Chad.Paavola@nasa.gov 2. Shigenobu Mitsuzawa<sup>4</sup>, 3. Hiromi Kagawa<sup>2</sup>, 4. Suzanne Chan<sup>2</sup>, 5. Natalya Dvorochkin<sup>3</sup>, 6. Eduardo Almeida<sup>1</sup>, 7. Oana Marcu<sup>3</sup>, 8. Sharmila Bhattacharya<sup>1</sup>, 9. Sigrid Reinsch<sup>1</sup>, Dr. 10. Yifen Li<sup>2</sup>, Dr. 11. Jonathan Trent<sup>1</sup>, Efficient breakdown of cellulosic feedstocks to fermentable sugars remains a key barrier for processes that convert cellulosic biomass into fuels and chemicals. The bacterium *Clostridium thermocellum* produces a formidable array of enzymes to break down cellulosic biomass. Many of these enzymes are organized into structures anchored to the cell surface known as cellulosomes. Organization of cellulosomal enzymes into complexes increases their efficacy both in the cellulosome and in engineered two- and three-enzyme complexes. We have created an assembly based on a chaperonin from the hyperthermophilic organism *Sulfolobus shibatae* that binds up to eighteen cellulosomal enzymes on the ends of a nine-member double ring. We have characterized the enhanced activity of combinations of two, three or four cellulolytic enzymes attached to this structure and begun to explore activity on natural biomass substrates using combinations of a larger number of enzymes including those that degrade hemicellulose.

**WM2 Structure-function relationships in the sub-domains of the Family 7 cellulase from *Trichoderma reesei*** 1. National Renewable Energy Laboratory, National Bioenergy Center, Golden, CO, 1. Gregg T Beckham<sup>1</sup>, gregg.beckham@nrel.gov 2. William S Adney<sup>2</sup>, 3. James F Mathews John Yarbrough<sup>2</sup>, Mark R Nimlos<sup>1</sup>, Michael E Himmel<sup>2</sup>, Michael F Crowley<sup>2</sup>, The *Trichoderma reesei* Family 7 cellobiohydrolase (Cel7A) is an industrially relevant, modular, processive enzyme composed of a carbohydrate-binding module and catalytic domain connected by a glycosylated linker. Understanding the mechanism by which Cel7A de-crystallizes cellulose and hydrolyzes cellodextrins to cellobiose will permit determination of the rate-limiting steps in cellulose conversion by this important enzyme, which will in turn enable rational design strategies to improve cellulase cocktails for biofuel applications. To that end, here we present a two-part computational study. First, we study the structural impact of glycosylation on the Cel7A linker. The conformational states that the linker adopts provide clues to the role that the linker plays in the processivity of Cel7A. Second, we use simulation to investigate the CBM action on crystalline cellulose. The results from these simulations aid in understanding the role of the CBM in processivity.

**WM3 Understanding cellobiohydrolase processivity: Computational study of underlying mechanisms** 1. National Renewable Energy Laboratory, Chemical and Biosciences Center, Golden, Colorado, 1. Michael F Crowley<sup>1</sup>, michael.crowley@nrel.gov 2. Gregg T Beckham<sup>1</sup> 3. Lintao Bu<sup>1</sup> 4. Mark R Nimlos<sup>1</sup> 5. William S Adney<sup>1</sup> 6. Michael E Himmel<sup>1</sup>: The most widely used enzyme in commercial conversion of lignocellulosic biomass to sugars, CBH I or Cel7A from *Trichoderma reesei*, functions by a processive mechanism that is not understood mechanistically or thermodynamically. Improvement of this enzyme's performance is important to the success of biofuels from biomass. Our studies of this enzyme and its substrate, cellodextrin, show the key residues in the reaction tunnel involved in moving the substrate into position for reaction and in the expulsion of cellobiose product. Molecular dynamics simulations were used to model the dynamical behavior of the enzyme and substrate. Statistical sampling methods are employed to determine a likely path and mechanism of motion through the tunnel, the barriers to movement, and the overall energetic and free-energetic profile of the movement at several levels of approximation. Our results suggest several possibilities for improvement of enzyme performance.

**WM4 Development of cell surface engineering (arming technology) in the design of revolutionary whole-cell biocatalyst for lignocellulose utilization** 1. Kyoto U., Grad. Sch. Agric., Kyoto, Japan 1. Mitsuyoshi Ueda<sup>1</sup> miueda@kais.kyoto-u.ac.jp Lignocellulosic biomass consists mainly of three constituents, cellulose, hemicellulose, and lignin. Synergistic reaction by cellulolytic enzymes, endoglucanase, cellobiohydrolase, and beta-glucosidase, can produce glucose from cellulose, which can be assimilated into fermentative ethanol in the yeast *S. cerevisiae*. Cell surface engineering of yeasts is an attractive strategy for molecular breeding of novel yeasts and whole-cell biocatalysts that can directly produce ethanol from cellulose. The cellulolytic enzymes could be displayed on the yeast cell surface with the retention of their enzymatic activities, and the yeast can produce fermentative ethanol after the hydrolytic degradation of cellulosic biomass. Consolidated bioprocessing (CBP) of lignocellulose to ethanol is the most ideal system, as a potential approach to low-cost bioethanol production, combining multisteps of production of cellulolytic enzymes, cellulose hydrolysis, and fermentation of sugars in one reactor. Cell surface engineering is the epoch-making technology required for CBP to produce biofuels from cellulosic biomass in the future.

**WM6 Effects of cultivation media on bacterial communities and performance of microbial fuel cells** 1. Oregon State University, Biological and Ecological Engineering, Corvallis, OR, 1. Shoutao Xu<sup>1</sup>, xush@enr.orst.edu 2. Hong Liu<sup>1</sup>, liuh@enr.orst.edu cultivation media with different electron acceptors were examined to enrich exoelectrogens for microbial fuel cells (MFCs). The bacterial compositions with these different cultivation methods were considerable different from each other and from the bacterial community of the inoculum, as revealed by denaturing gradient gel electrophoresis (DGGE) profiles of the 16S rDNA. The power densities of MFCs with bacteria enriched with these different media were much lower than that of the mixed-culture inoculums enriched directly using MFCs. These results indicate that cultivation media can significantly affect the composition of bacterial communities and the power generation of MFCs. Further development in cultivation methods is needed for the enrichment and isolation of highly efficient exoelectrogens.

**WM7 Industrial applications of castor oil and the castor plant** 1. USDA-ARS-WRRC, Albany, CA Thomas A. McKeon<sup>1</sup>, thomas.mckeon@ars.usda.gov The castor plant, *Ricinus communis* L., is the source of castor seeds that contain castor oil. Castor oil is unique among vegetable oils in that ricinoleic acid (12-hydroxy-oleic acid) makes up 90% of the fatty acid content of the oil. The major impediment to growing castor is the presence of ricin and a potent allergen in the seed, necessitating special handling or energy intensive treatment to neutralize these noxious proteins. Castor oil has numerous applications, providing bio-based lubricants, surfactants, low VOC coatings, precursors for Nylon 11 (11-amino-undecanoate), Nylon 6,10 (sebacic acid), plasticizers and numerous personal care products. Methyl esters derived from castor oil impart excellent lubricity to diesel fuel when added at 0.5% (v/v). Due to limited supply it has not found its way into the biodiesel market, except in Brazil, where it provides approximately 12% of the biodiesel produced by Petrobras. Currently, there is approximately 500,000 metric tons of castor oil produced worldwide. Thus, the biodiesel market alone would require an extensive increase in castor oil production: as a 0.5% additive to petroleum diesel, the US would require 750,000 metric tons annually. In

order to meet this need, considerable research effort needs to be expended on uses of the castor crop residues. The seed meal has been used as animal feed in the past and, while it has an acceptable amino acid composition, it has a detrimental effect when fed to chickens at >15% of feed. Currently, it is used as an organic fertilizer or burned for fuel. The field residue is most often plowed under, a procedure which can lead to pest problems. Due to the large quantity of biomass that a castor crop can generate, there is considerable potential for converting the stalks to ethanol, when suitable processing approaches have been identified.

**WM8 Robust yeast biocatalyst for cellulosic ethanol production** 1. Cargill Incorporated, Biotechnology Development Center, Excelsior, MN, 1. Pirkko Suominen<sup>1</sup>, 2. Gary Folkert<sup>1</sup>, 3. Holly Jessen<sup>1</sup>, holly\_jessen@cargill.com 4. Liz Dierickx<sup>1</sup>, 5. Beth Mastell<sup>1</sup>, 6. Joshua Lundorff<sup>1</sup>, 7. Ana Negrete-Raymond<sup>1</sup>, 8. Gregory Poynter<sup>1</sup>, 9. Brian Rush<sup>1</sup>, 10. Ken Finley<sup>1</sup> Cargill has utilized its expertise in strain engineering and fermentation to develop a yeast biocatalyst capable of efficient fermentation of ethanol from cellulosic biomass hydrolysates. The CB1 yeast first engineered and used for commercial lactic acid production at Cargill has many characteristics that also make it a useful biocatalyst for cellulosic ethanol. These attributes include high yield and productivity, and tolerance to low pH, ethanol, high temperature, and inhibitors. Pathways for xylose and arabinose utilization have been engineered into CB1 and fermentation of these sugars to ethanol demonstrated. Strain improvement has been conducted using a combination of metabolic engineering, mutagenesis and selection, and strain evolution. The improved strains are tolerant of the acetic acid and inhibitors in corn stover hydrolysate and can efficiently ferment glucose and xylose in non-detoxified hydrolysate. The physiology of CB1 and an extensive toolbox for strain improvement make this yeast a very useful platform organism for biofuel and chemical production.

### **WEDNESDAY AFTERNOON March 24 Section A**

#### **Recent Developments in Food-related Nanotechnology**

Bosoon Park, James Oxley, Michael Appell, Evangelyn Alocilja, Organizers, Presiding

1:15 Introductory Remarks.

1:20 246. Probing flavor partitioning and transport within nanostructured food matrices. S. R. Dungan, W. J. Musnicki, N. W. Lloyd, R. J. Phillips, S. E. Ebeler

1:45 247. Effects of oil type and emulsifiers on the formation and stability of flavor nanoemulsions. J. Zhang, G. Reineccius, T. Peppard

2:10 248. Nano-emulsions prepared by a low-energy emulsification method applied to edible films. C. Bilbao-Sainz, R. J. Avena-Bustillos, D. F. Wood, T. G. Williams, T. H. McHugh

2:35 249. Nanoencapsulation of omega-fatty acid into a biopolymer matrix: Effect of cocoa polyphenols on oxidative stability. G. K. Kouassi, K. Nottoli, V. K. Teriveedhi  
3:00 Intermission.

3:15 250. Self-assembly of zein into nanoscale soft spheres. Y. Wang, G. W. Padua

3:40 251. Antimicrobial thin films containing CTAB as model for protective food packaging. J. C. Grunlan, G. Sukhonosova

4:05 252. Silver nanoparticles migration through polyethylene membranes. R. A. Trbojevich, P. H. Siitonen

4:30 253. Nanotechnology for removal of heavy metals and radionuclides from foodstuffs. A. W. Apblett, H. Al-Busaidi

**WA2 Probing flavor partitioning and transport within nanostructured food matrices** 1. University of California, Davis, Dept. of Food Sci/Tech; Dept. of Chem Eng/Mats Sci, Davis, California, 2. University of California, Davis, Department of Viticulture and Enology, Davis, California, 3. University of California, Davis, Department of Chemical Engineering and Materials Science, Davis, California, 1. Stephanie R. Dungan<sup>1</sup>, srdungan@ucdavis.edu 2. Wyatt J Musnicki<sup>3</sup>, 3. Nathan W Lloyd<sup>3</sup>, 4. Ronald J. Phillips<sup>3</sup>, 5. Susan E. Ebeler<sup>2</sup>, Microemulsions can incorporate hydrophobic flavors and other ingredients, and thereby influence their distribution and release. We used solid phase microextraction, which employs a thin fiber coated with an absorptive polymer film, to sample the headspace above an aqueous phase containing various surfactant concentrations and a constant total amount of limonene. The headspace concentration was unaffected by the surfactant below the cmc. Above the cmc, the limonene volatility was reduced substantially, an effect that was used to determine the partitioning of limonene inside and outside the microemulsion droplet. Holographic interferometry was used to measure the diffusion of droplets themselves within an agarose gel matrix. The effect of the gel in hindering diffusion was determined in the dilute particle limit; time-resolved fluorescence showed only a small effect of the gel on the microemulsion structure. At higher surfactant concentrations, the gel strongly enhanced the increase of the diffusion coefficient with increasing particle concentration.

**WA3 Effects of oil type and emulsifiers on the formation and stability of flavor nanoemulsions** 1. Univ. of Minnesota, Dept of Food Science and Nutrition, Saint Paul, MN, 2. Robertet Flavors, Inc., Piscataway, NJ, 1. Jian Zhang<sup>1</sup>, zhang513@umn.edu 2. Gary Reineccius<sup>1</sup>, greinecc@umn.edu 3. Terry Peppard<sup>2</sup>, .com Nanoemulsions offer unique opportunities to incorporate lipophilic actives (e.g. flavorings) into food products. The challenge of manufacturing nanoemulsions is two fold: to create nanoscale emulsions (<100nm) with narrow size distribution and to stabilize the nanoemulsions against Ostwald ripening. In this work, flavor nanoemulsions were produced using high pressure homogenization and stabilized with small or large molecule emulsifiers. The formation and stability of nanoemulsions were studied by using dynamic light scattering (DLS), electron microscope, and turbidimeter. Our results showed that nanoemulsions could be formed with a mass weighted mean droplet diameter (MDD) as small as 70 nm by using both small molecule emulsifier (Q-Naturale) and food biopolymers (modified starch). Physical properties (viscosity and polarity) of the oil phase and molecular properties of emulsifiers (charge, molecular weight and adsorption kinetics) had a significant influence on the formation and stability of flavor nanoemulsions. The viscosity ratio between phases was found to be a key parameter determining the formation of nanoemulsions. Ostwald ripening was identified as the main destabilization mechanism of flavor nanoemulsions due to considerable water solubility of flavor oils. Incorporation of ester gum

or medium chain triglycerides (MCT) with the flavor oils provided significant inhibition of Ostwald ripening. This work has provided an understanding of the formation and stabilization of nanoemulsions relevant to the flavor industry

**WA4 Nano-emulsions prepared by a low-energy emulsification method applied to edible films** 1. WRRRC/ARS/USDA, Albany, CA 1. Cristina Bilbao-Sainz<sup>1</sup>, cristina.bilbao@ars.usda.gov 2. Roberto J Avena-Bustillos<sup>1</sup>, 3. Delilah F Wood<sup>1</sup>, 4. Tina G Williams<sup>1</sup>, 5. Tara H McHugh<sup>1</sup>, The low-energy emulsification method phase inversion composition (PIC) was used to prepare O/W nano-emulsions in the water/Acetem/non-ionic surfactant system. Composition and process variables were optimized to minimize droplet size and polydispersity index. It was found that above a critical surfactant to oil ratio (0.5:1.0), addition of the continuous phase to the dispersed phase following the standard way of catastrophic phase inversion resulted in the formation of oil droplets with diameters around 100 nm. The drop size distribution before the inversion point was wide, while after catastrophic inversion was much narrower. The nano-emulsion was used as a carrier to incorporate oregano and cinnamon oil to soy protein edible films. The resulting composite films showed better moisture barrier and mechanical properties as compared with soy protein films.

**WA5 Nanoencapsulation of omega-fatty acid into a biopolymer matrix: Effect of cocoa polyphenols on oxidative stability** 1. Western Illinois University, Chemistry, Macomb, IL, 1. Gilles K. Kouassi<sup>1</sup>, gkk100@wiu.edu 2. Katheryn Nottoli<sup>1</sup>, K-Nottoli@wiu.edu 3. Vinod K Teriveedhi<sup>1</sup>, VK-Teriveedhi@wiu.edu The effect of cocoa polyphenols on the oxidative stability of omega-fatty acid was investigated. Cocoa polyphenols were extracted from fermented cocoa beans and high performance liquid chromatography (HPLC) was used to determine the phenolic profile of the extracts. About 82 ppm of polyphenols extract was added to amounts of eicosapentaenoic acid (EPA) and encapsulated into kappa-carrageen/ maltodextrin using power ultrasound. The sizes of the nanocapsules were determined using atomic force microscopy (AFM). The oxidative stability expressed as percentage inhibition was evaluated by measuring the amount of hydroperoxides in the nanocapsules after exposure to heating at 60 °C. The particle sizes were between 56 and 71 nm. The percentage inhibition was 51% in nanoencapsulated EPA, and 73 % in nanoencapsulated EPA containing polyphenol extracts. Nanoencapsulation increased the oxidative stability of omega-fatty acid, EPA. Adding polyphenol extracts further limited the extent of oxidation of EPA.

**WA7 Self-assembly of zein into nanoscale soft spheres** 1. University of Illinois, Urbana-Champaign, Department of Food Science and Human Nutrition, Urbana, IL, 1. Yi Wang<sup>1</sup>, Dr., yiwang2@illinois.edu 2. Graciela Wild Padua<sup>1</sup> Zein, a major protein of corn, is insoluble in water but readily dispersed in alcohol-water mixtures. Its amino acid sequence, containing > 50% hydrophobic residues, gives it an amphiphilic character. Zein had been observed to self-assemble into lyotropic microphases in aqueous alcohol. The objectives of this work were to 1) build a phase diagram of zein microphases in ethanol-water, 2) model phase boundary lines applying Flory-Huggins solution theory. Zein was dispersed in ethanol-water mixtures 30 - 95 % ethanol (v/v) to obtain series of increasing zein concentration. Microphase transitions were detected from surface morphology changes observed in SEM images taken after solvent evaporation. Three microphases were identified. Zein self-assembled from disordered molecular dispersions into soft spheres of nanoscale size. A theoretical model based on Flory-Huggins solution theory was used to fit microphase boundaries lines. Improved understanding of zein self-assembly and microphase formation is expected to guide the development of zein applications in food nanotechnology.

**WA8 Antimicrobial thin films containing CTAB as model for protective food packaging** 1. Texas A&M University, Department of Mechanical Engineering, College Station, TX, 1. Jaime C. Grunlan<sup>1</sup>, jgrunlan@tamu.edu 2. Galina Sukhonosova<sup>1</sup>, Layer-by-layer deposition was used to incorporate antimicrobial molecules into thin films. Anionic poly(acrylic acid) (PAA) was alternately deposited with cationic poly(diallyldimethylammonium chloride) (PDDA) from aqueous solutions. The antimicrobial agent, cetyltrimethylammonium bromide (CTAB), was incorporated into the cationic layers. Film growth and microstructure were analyzed, with 20-bilayer films being 4 μm thick. The antimicrobial efficacy of these films was observed to vary with a variety of factors. With greater numbers of layers and at lower temperatures, the effectiveness increases. Longer delays between deposition and testing lead to some loss in antimicrobial efficacy. These films are capable of releasing CTAB over the course of approximately 4 days, as evidenced by kill of *S. aureus* and *E. coli* in a Kirby-Bauer test. These thin film coatings could be deposited directly onto plastic films already being used for food packaging or an appropriate recipe could potentially be deposited directly onto certain foods (e.g., fruit).

**WA9 Silver nanoparticles migration through polyethylene membranes** 1. National Center for Toxicological Research-FDA, Division of Biochemical Toxicology, Jefferson, Arkansas 1. Raul A Trbojevich<sup>1</sup> raul.trbojevich@fda.hhs.gov 2. Paul H Siitonen<sup>1</sup>, paul.siitonen@fda.hhs.gov Silver nanoparticles (SN) were prepared using a citrate synthesis technique. The particles obtained in this synthesis were characterized and quantified by UV-vis spectroscopy, energy dispersive spectroscopy (EDX), and transmission electron microscopy (TEM) analysis. The SN were shown to average 47 nm diameter spherical particles with an acceptable mono-disperse size distribution. The concentration of nanoparticles was obtained from TEM image using analytical relations and assuming a spherical shape and uniform face-centered cubic structure. From a series of dilutions of the original SN dispersion with distilled water, a calibration curve was constructed. A migration study was performed using low density (LDP) and high density (HDP) polyethylene bags with thickness of approximately 20 μm. The bags, with the SN dispersion, were placed in a vessel containing NANOpure water acting as an aqueous foods simulant and the spontaneous migration of the SN through the polyethylene bags was monitored for one month. Similar experiments were conducted using a 50 W sonication bath for a period of one hour and 1 KW microwave exposures for 150 seconds. The concentration of the SN in the aqueous foods simulant was calculated using the calibration curve. The results indicated that SN were able to migrate through the both membranes, with the extent and rate being greater for LDP polyethylene bags and when applying sonication. Migration of SN was not detected when using microwave exposures. The results also indicated that UV-vis spectroscopy is a simple and versatile method to calculate concentrations of SN ranging from 1.2x10<sup>11</sup> to 7.1x10<sup>13</sup> nanoparticles per L (0.2 pM to 120 pM)

**WA10 Nanotechnology for removal of heavy metals and radionuclides from foodstuffs** 1. Oklahoma State University, Department of Chemistry, Stillwater, OK, 1. Allen W Apblett<sup>1</sup>, allen.apblett@okstate.edu 2. Hamed Al-Busaidi<sup>1</sup>, Foodstuffs and their ingredients can be contaminated with heavy metals and radionuclides from natural or anthropogenic sources. For example plants will concentrate uranium that occurs naturally in soil or is present due to the use of uranium-containing armor-piercing weapons. Nuclear fallout due to reactor accidents

or atomic bombs can lead to milk contaminated with radioactive strontium isotopes. Also, most natural calcium sources contain lead that can be of concern when ingested by children. Nanoparticulate calcium tungstate and tungsten oxide react selectively with heavy metals and actinides, allowing their separation from beneficial metal ions. Such reactions can be used to remove strontium from milk or lead from calcium-containing food additives and prevent uptake of actinides by crops.

### **Wednesday AFTERNOON March 24 Section B**

#### **General Papers**

Michael Appell, Organizer      Betty Burri, Deepthi Weerasinghe, Navindra Seeram, Presiding

1:15 Introductory Remarks.

1:20 254. Molecularly imprinted polymers for the isolation of polyphenols from food processing byproducts. L. J. Schwarz, B. Danylec, R. I. Boysen, S. J. Harris, M. T. W. Hearn

1:45 255. Novel method to remove ochratoxin A from food commodities: Molecularly imprinted polymer synthesis suited for filtration. A. Yiannikouris, S. Kwiatkowski, C. Matney, M. Kudupoje

2:10 256. Development and characterization of monoclonal antibodies to botulinum neurotoxin type B and type E, and their incorporation into a sensitive sandwich ELISA for toxin detection. M. C. Scotcher, L. W. Cheng, D. L. Brandon, L. H. Stanker

2:35 257. Rapid analyses of ink photoinitiators with a multimethod in food packaging materials and foodstuffs. T. Gude, T. Richter

3:00 Intermission.

3:15 258. Tolerance reassessment of pesticide product inert ingredients: Process for data development. K. Leifer, P. V. Shah

3:40 259. Multiresidue analysis of pesticides in food matrices by gas chromatography-tandem mass spectrometry (GC-MS/MS) and liquid chromatography-tandem mass spectrometry (LC-MS/MS) . K. Zhang, J. Wong, M. Smoker, P. Yang, D. Hayward, A. Krynitsky

4:05 260. Humic or anthropogenic? Characterization of natural and anthropogenic contributions to humic and fulvic acids in groundwater. C. Zwiener, C. Jobelius, F. H. Frimmel

4:30 261. Comparative study of xylitol production from corn stalk hemicellulose extracted with hydrogen peroxide. H.-H. Wang, X.-F. Sun, G. Zhang, Y. Wu

**WA2 Molecularly imprinted polymers for the isolation of polyphenols from food processing byproducts** 1. Monash University, Centre for Green Chemistry, Melbourne, Victoria, Australia 1. Lachlan J. Schwarz<sup>1</sup>, 2. Basil Danylec<sup>1</sup>, 3. Reinhard I. Boysen<sup>1</sup>, reinhard.boysen@sci.monash.edu.au 4. Simon J. Harris<sup>1</sup> 5. Milton T. W. Hearn<sup>1</sup>, Molecularly imprinted polymers (MIPs) are synthetic materials designed to recognize target molecules in a host-guest molecular interaction. There is considerable scope to develop MIPs into reusable tools for the selective enrichment of naturally occurring polyphenols from agricultural wastes and by-products. This presentation describes an approach for this purpose. The production of the MIPs involved the chemical synthesis of molecular templates related to the target polyphenols, the molecular modeling of the functional monomer-target interactions in various pre-polymerization complexes and <sup>1</sup>H-NMR-spectroscopic titration for the selection of suitable monomers. Various MIPs were synthesized from these molecularly self-assembled pre-polymerization complexes, followed by template removal and binding site evaluation with a variety of chemically synthesized analogues of the target polyphenols. In a practical application, these MIPs successfully captured target polyphenols from grape marc and peanut meal in a solid-phase extraction process. Such MIP-based enrichment methods for bioactive compounds from agricultural waste materials provide a new, efficient, cost effective and sustainable path to resource utilization.

#### **WA3 Novel method to remove ochratoxin A from food commodities: Molecularly imprinted polymer synthesis suited for filtration**

1. Alltech, Department of Animal Nutrigenomics and Applied Animal Nutrition, Nicholasville, KY, 1. Alexandros - Yiannikouris<sup>1</sup>, ayiannikouris@alltech.com 2. Stefan - Kwiatkowski<sup>1</sup>, 3. Clayton Matney<sup>1</sup>, 4. Manoj Kudupoje<sup>1</sup> Synthesis of molecularly imprinted polymers (MIP) that can sequester ochratoxin A (OTA) has been studied in order to scale up production from minute quantities to large scale and provide economically viable synthesis of non-toxic and novel MIPs material for the removal of toxic fungal metabolite from food/feed matrices. Therefore, a method was developed for OTA removal from wine with respect to preserving organoleptic properties. In this context, the high yield synthesis of a non-toxic structural analogue to the OTA molecule was achieved. The final template exhibited hydroxyl and carboxylic groups, a peptide bond and a hydrocarbon fragment enabling correct interaction with monomers and cross-linker during the polymerization stages. Monomers and cross-linker compositions and several polymerization alternatives were investigated toward OTA sequestering and compared with non-imprinted polymers (NIP) materials. Swelling, bleeding, and size fractionation properties of the MIPs were carefully investigated as well as prolonged or instant filtration properties. Application in model wine medium resulted in the selection of an appropriate MIP composition in favour of optimal OTA removal (patent pending).

#### **WA4 Development and characterization of monoclonal antibodies to botulinum neurotoxin type B and type E, and their**

**incorporation into a sensitive sandwich ELISA for toxin detection** 1. USDA, Agricultural Research Service, Albany, CA 1. Miles C Scotcher<sup>1</sup> miles.scotcher@ars.usda.gov 2. Luisa W Cheng<sup>1</sup>, 3. David L Brandon<sup>1</sup>, 4. Larry H Stanker<sup>1</sup>, : Monoclonal antibodies (mAbs) to botulinum neurotoxin type B (BoNT/B) and type E (BoNT/E) were generated using either a direct binding ELISA, or a capture-capture ELISA. A total of five mAbs for BoNT/B were selected, two of which bound the light chain and three bound the receptor-binding domain of the toxin. Antibodies F24-1, F26-16, F27-33 and F29-40, identified via a direct binding ELISA, were not capable of capturing native toxin but were able to capture BoNT/B in solution in the presence of SDS at a concentration of 0.5-0.9 mM and were incorporated into an SDS-dependent sandwich ELISA, with a detection limit of 90 pg/mL BoNT/B. Antibody MCS 6-27 was identified via the capture-capture

ELISA and used to develop a sensitive sandwich ELISA which did not require SDS, with a detection limit of 1-2 pg/mL BoNT/B. Antibodies to BoNT/E were isolated and shown to have properties similar to those for BoNT/B.

**WA5 Rapid analyses of ink photoinitiators with a multimethod in food packaging materials and foodstuffs** 1. Swiss Quality Testing Services, Department of Food/Non-Food, Dietikon., Switzerland 1. Thomas Gude1 , Dr. thomas.gude@sqts.ch 2. Tina Richter1: In food packaging industry, photoinitiators are widely used for UV inks and lacquers and can be found in many products. Isopropyl-9H-thioxanthene-9-one (ITX) is a major representative. Benzophenone however is the only regulated in the EC Directive 2002/72, with a specific migration limit of 0.6 mg/kg food. Inks applied to food packaging materials (FCM) are currently not specifically regulated in US and in the EC legislation. Switzerland however, uses more detailed regulation for FCM covering inks with a deadline for submission of data end of March 2010. Key issue will be beside toxicological profiles also the analytic of printing ink components. To reduce analytical costs, a rapid multi method is used to determine common photoinitiators (25). Migration is simulated with MPPPO known as Tenax®. The analysis by UPLC-MSMS yielded a Lod of 0.1 µg/dm<sup>2</sup> for packagings and 10 µg/kg for food. All results are verified by UPLC-MS/TOF and will be presented

**WA7 Tolerance reassessment of pesticide product inert ingredients: Process for data development** 1. US Environmental Protection Agency, Kerry Leifer1 , leifer.kerry@epa.gov 2. P.V. Shah1 , The Food Quality Protection Act (FQPA) directed EPA to review the safety of all existing tolerances and tolerance exemptions that were in effect as of August 1996. As part of its evaluation of tolerance exemptions for pesticide inert ingredients, EPA identified 132 tolerance exemptions for which there were insufficient data to meet FQPA's more stringent safety standard. Since a number of these tolerance exemptions were for substances that were seen as important to the pesticide industry, EPA developed a approach to allow for data development efforts to be undertaken that would be cost-effective and would provide the Agency with the information needed to complete the risk assessments needed to meet the FQPA safety standard.

**WA8 Multiresidue analysis of pesticides in food matrices by gas chromatography- tandem mass spectrometry (GC-MS/MS) and liquid chromatography-tandem mass spectrometry (LC-MS/MS)** 1. U.S. Food and Drug Administration, Center for Food Safety and Applied Nutrition, College Park, MD, 2. U.S. Food and Drug Administration, Office of Regulatory Affairs, Lenexa, KS, 3. Ontario Ministry of the Environment, Etobicoke, Ontario, 1. Kai Zhang1, U.S. Food and Drug Administration, Center for Food Safety and Applied Nutrition, 5100 Paint Branch Parkway, HFS-706, College Park, MD, kai.zhang@fda.hhs.gov 2. Jon Wong1 , 3. Michael Smoker2 , 4. Paul Yang3 , 5. Douglas Hayward1 , 6. Alex Krynitsky1 , A multiresidue analysis procedure is described for the determination of 360 pesticides in various food matrices. Samples were prepared using QuEChERS procedures using acetonitrile saturated with magnesium sulfate and sodium chloride, followed by solid-phase dispersive cleanup. For LC-MS/MS analysis, samples were cleaned up using primary-secondary amine sorbent but for GC-MS/MS analysis, samples were cleaned up using a combination of primary-secondary amine and graphitized carbon black sorbents and toluene. Analysis is performed by GC-MS/MS for 169 organochlorine, organophosphate, organonitrogen, hydrocarbon and pyrethroid pesticides and LC-MS/MS in electrospray ionization (ESI) mode for 191 thermally labile and polar pesticides. The limits of quantitation (LOQs) for most of the pesticides are less than 10 µg/kg and quantitation was determined from calibration curves of matrix-matched standards ( $r^2 > 0.99$ ) from 8.33 - 6777 µg/L for GC-MS/MS and 1 - 100 µg/L for LC-MS/MS , respectively. Recovery studies were performed by fortifying the food matrices at concentrations of 10, 25, 100 and 250 (or 500) µg/kg, resulting in recoveries between 70% - 120% for 80% of the pesticides at 10 and 20 µg/kg and 90% of the pesticides at 100 and 250 (or 500) µg/kg with RSDs less than 20%. Lower (<70%) and higher (>120%) recoveries were most likely from complications of pesticide liability or volatility, matrix interference, or inefficient desorption from the solid-phase sorbents. The procedure was used to analyze incurred samples containing various classes of pesticides at concentrations ranging from 1 - 2000 µg/kg.

**WA9 Humic or anthropogenic? Characterization of natural and anthropogenic contributions to humic and fulvic acids in groundwater** 1. University of Tuebingen, Institute for Geoscience, Environmental Analytical Chemistry, Tuebingen, Germany 2. University of Karlsruhe, Engler-Bunte-Institute, Water Chemistry, Karlsruhe, Germany 1. Christian Zwiener1 christian.zwiener@uni-tuebingen.de 2. Carsten Jobelius2 , 3. Fritz H. Frimmel2 , The interactions of contaminants with natural organic matter (NOM) highly determines their transport, fate, and bioavailability in the aquatic environment. NOM can be fractionated in humic substances (HS), fulvic (FA) and humic acids (HA) on an operationally-defined basis. Contaminants associated with or behaving like humics are a concern for groundwater because they are highly mobile and may not be removed during drinking water treatment. The objective of this work is to characterize HA and FA fractions with respect to their anthropogenic contributions in isolated material from contaminated groundwater and a natural surface water. Characterization methods include elemental analysis, fluorescence spectroscopy, size-exclusion (SEC) and reversed-phase (RP-HPLC) chromatography, LC electrospray ionization tandem mass spectrometry (LC-ESI-MS-MS) and LC-ESI-quadrupole-time of flight-mass spectrometry (LC-ESI-Q-TOF-MS). The results are discussed under consideration of the significance for drinking water treatment and protection of drinking water resources.

**WA10 Comparative study of xylitol production from corn stalk hemicellulose extracted with hydrogen peroxide** 1. Northwestern Polytechnical U, Dept of Chemistry, Xi'an, China 1. Hai-hong Wang1 , xgdwhh@163.com 2. Xiao-Feng Sun1, xf001sn@hotmail.com 3. Guangcheng Zhang1 , guangchengzhang@nwpu.edu.cn 4. yaoguowu@nwpu.edu.cn This paper studied extraction of hemicelluloses from corn stalk, and fermentation of the hemicellulosic hydrolysate to product xylitol. The experimental results showed that the optimized parameters for isolation of hemicellulose was: 2% H<sub>2</sub>O<sub>2</sub> 2% NaOH, heating time for 4h, reaction temperature at 75 °C. After hydrolysis of hemicellulose using CF<sub>3</sub>COOH, the xylose content obtained was about 67-73%, and the hydrolysis rate was between 76-84%, and the xylose content with HCL pretreatment rose to 87.9%, and the hydrolysis rate rose around 90%. The products of hydrolysis using H<sub>2</sub>SO<sub>4</sub> -were miscellaneous. The results in enzymatic hydrolysis showed that the specificity of xylanase was higher than hemicellulase. The hydrolysis rate by xylanase was about 38-60%. The highest biotransformation ratio of xylitol occurred between 24-48h by using *Candida tropicalis*, and it is found that the yield of xylitol obtained from the fermentation of the enzyme hydrolyzate is higher than the chemical hydrolyzate.

## **Wednesday AFTERNOON March 24 Section C**

### **Sustainability of Our Food Supply: From Farm to Fork**

(Cosponsor: Chemistry for a Sustainable World)

Sara Risch, Alyson Mitchell, Victoria Finkenstadt, Organizers Sara Risch, Presiding

1:30 262. Overview: Sustainability of our food supply. S. J. Risch

1:45 263. Honig Vineyard and Winery's experience: Practical applications of sustainable business practices for a small family owned winery. K. Belair

2:15 264. Sustainability of packaging materials. S. J. Risch

2:45 265. OPEC, biofuel, and food prices. G. Hochman, D. Rajagopal, D. Zilberman

3:15 Panel Discussion.

**WA1 Overview: Sustainability of our food supply** 1. Science By Design, 1. Sara J. Risch1, sjrisch@sbcglobal.net Sustainability is an issue affecting all areas of our lives. In looking at our food supply, there are many segments that need to be addressed. From an agricultural point, we need to be concerned about producing enough food but not using pesticides and herbicides that may create potential problems with our water supply and environment. There is debate over the use of biotechnology to produce crops that give higher yields and potentially higher nutrient content versus growing foods organically. In the food processing area, energy and water usage are major issues with interest in conserving the use of both while still making safe and high quality products. Continuing through the food system, there are issues with packaging and distribution. While some materials themselves may be more sustainable, they may result in much higher transportation and thus energy costs to distribute. When you get to the final consumer, the issue is how long the product lasts and what they do with the waste that is generated. There is waste of food that spoils due to improper packaging or handling and there is waste of the packaging materials. From farm to fork, each step of the process needs to be evaluated not in isolation but in relation to its impacts on the other steps in getting food to our tables.

**WA2 Honig Vineyard and Winery's experience: Practical applications of sustainable business practices for a small family owned winery** 1. Honig Vineyard and Winery, Rutherford, CA, 1. Kristin Belair1 kristin@honigwine.com Sustainability incorporates a broad range of applications, measurements and experiences. It is a dynamic goal that fosters continual evaluation and improvement, embracing new technologies and information as they become available, as well as exploring currently available models. As a small, family owned business, Honig Vineyard and Winery sees itself as a generational business. We want to be able to leave healthy lands, businesses and communities to the generations to come. This report will cover what our experiences with sustainable business practices have been so far and what we hope to accomplish in the future.

**WA3 Sustainability of packaging materials** 1. Science By Design, East Lansing MI, 1. Sara J. Risch1, sjrisch@sbcglobal.net There is huge interest today in sustainability of packaging materials. Many people focus on the amount of packaging being used and the fact that much of it is derived from petroleum resources, which are in finite supply. Some research is focusing on bio-based materials as an alternative. The challenges that exist with these are making materials with the same properties to give the protection that the foods need as well as costs and the trade-off on inputs required to grow the plants. While recycling is desirable, there are some materials such as glass that are recyclable but in some areas the energy required to transport them to an area where they can be recycled is greater than what the material is worth. Over the past few years, there has been greater focus on reducing the amount of packaging being used. While it is desirable to minimize packaging, when you get it to the point that you reduce the shelf-life of the product and produce more waste in terms of spoiled food, you have gone against sustainability. Packaging will continue to be an area of intense interest in the sustainability of our food supply. Care must be taken to weigh all of the factors involved so as not to create sustainable packaging at the expense of sustainable food supply.

**WA4 OPEC, biofuel, and food prices** 1. UC Berkeley, EBI, Berkeley, CA, 3. UC Berkeley, ARE, Berkeley, CA, 1. Gal Hochman1 galh@berkeley.edu 2. Deepak Rajagopal2 deeoak@berkeley.edu 3. David Zilberman3, zilber11@berkeley.edu Some traditional models of energy markets assume that they are competitive; others assume that OPEC is a cartel of firms. But OPEC is a cartel of nations. Building on these observations, which we support empirically, we use a simulation to assess the impacts of introducing ethanol (under various levels of mandates and subsidies) on fuel and food markets, while recognizing the importance of storage markets and its impact on food markets. Our results suggest that the current levels of ethanol production contribute to significant reduction in domestic fuel subsidies in OPEC countries and reduce prices of fuel in the rest of the world by about 1-2%. The reduction in fuel prices has a direct effect of increased supply, and an indirect effect of reduced monopoly power of OPEC. Other parts of the analysis estimate the effects of ethanol on food markets and domestic fuel consumers. Here, we find that fuel consumers benefited from the introduction of ethanol- when it is subsidized, but less when its production is induced by mandates. Food consumers suffered while crop producers benefited from high food prices. One factor that affects the outcome is the change in agricultural productivity, which may depend on the extent that biotechnology is introduced. The negative impacts of biofuel on consumers may decline significantly and its potential to contribute to the fuel market depends drastically on these productivity assumptions. Overall, the net effect of biofuel policies on consumers and producers of fuel and food depend on assumptions about elasticities in various markets, the changes in farm productivity and the behavior of OPEC.

## **THURSDAY MORNING March 25 Section A**

### **Recent Developments in Food-related Nanotechnology**

Bosoon Park, James Oxley, Michael Appell, Evangelyn Alocilja, Organizers, Presiding

9:00 Introductory Remarks.

9:05 266. Transparent foil replacement for food packaging based upon nano brick wall polymer-clay assemblies. J. C. Grunlan, M. A. Priolo

9:30 267. Systems mapping of consumer acceptance of agrifood nanotechnology. R. M. Yawson, J. Kuzma  
9:55 268. Delivering nutraceuticals and flavors using nanoemulsions. Y. Wang, C.-T. Ho, Q. Huang  
10:20 269. Isolation and quantitative detection of silver nanoparticles in food with nano-pore phase inverted poly(amic acid) membranes. N. Du, M. M. Feurstein, O. A. Sadik  
10:45 Concluding Remarks.

**ThM2 Transparent foil replacement for food packaging based upon nano brick wall polymer-clay assemblies** 1. Texas AMUniversity, Department of Mechanical Engineering, College Station, TX, 2. Texas AMUniversity, Department of Chemical Engineering, College Station, TX, 3. Texas AMUniversity, Materials Science and Engineering Program, College Station, 1. Jaime C. Grunlan<sup>1,2,3</sup> jgrunlan@tamu.edu 2. Morgan A. Priolo<sup>3</sup>, Thin films of anionic natural montmorillonite (MMT) clay and cationic polyethylenimine (PEI) have been produced by alternately dipping a plastic film into dilute aqueous mixtures containing each ingredient. After 40 polymer-clay layers have been deposited, the resulting transparent film exhibits an oxygen transmission rate (OTR) below 0.35 cm<sup>3</sup>/m<sup>2</sup>-day when the pH of PEI solution is 10. This low permeability is due to a brick wall nanostructure comprised of completely exfoliated clay bricks in polymeric mortar. This brick wall creates an extremely tortuous path at thicknesses below 250 nm and clay concentration above 80 wt%. A 70-bilayer PEI-MMT assembly has an undetectable OTR (< 0.005 cm<sup>3</sup>/m<sup>2</sup>-day), which equates to a permeability below SiO<sub>x</sub> when multiplied by its film thickness of 231 nm. With optical transparency greater than 86% and the ability to be microwaved, these thin film composites are good candidates for a microwaveable foil replacement in food packaging.

**ThM3 Systems mapping of consumer acceptance of agrifood nanotechnology** 1. University of Minnesota, Center for Science, Technology and Public Policy, Minneapolis, MN, 1. Robert M Yawson<sup>1</sup> yawso003@umn.edu 2. Jennifer Kuzma<sup>1</sup>, This study is based on theory that accounts for the dynamic aspects of systems modeling, risk perception, and consumer acceptance. A systems map showing key components, stages, and the links between underlying values, expressed attitudes and actual behaviors involving consumer acceptance of agrifood nanotechnology has been developed. The purpose of the study was to use systems mapping to examine and analyze critical links between consumer acceptance of agrifood nanotechnology and other factors such as trust, stakeholders, knowledge, and human environmental health risks. The study used meta-analysis of the literature and experts' opinion to develop the systems map. It is clear that factors affecting consumer acceptance of agrifood nanotechnology are dynamic, complex, interactive, and interdependent; and that consumer decision to accept agrifood nanotechnology is the results of complex feedback structure.

**ThM4 Delivering nutraceuticals and flavors using nanoemulsions** 1. Rutgers Univ., Dept of Food Science, New Brunswick, NJ, 1. Yuwen Wang<sup>1</sup> beanie@eden.rutgers.edu 2. Chi-Tang Ho<sup>1</sup>, 3. Qingrong Huang<sup>1</sup>, Curcumin and its? -diketone analogue dibenzoylmethane (DBM), although are well-known for their anti-carcinogen activities, have poor oral bioavailability partially due to their poor water solubility. In this talk, DBM nanoemulsion has been successfully formulated. Our pharmaceutical kinetic studies using rat model showed that the oral bioavailability of DBM in nanoemulsion was 4.68 times of that in conventional DBM emulsion. Spray-dried powders of curcumin were also formulated, and showed increased anti-bacterial activity compared to raw curcumin powders. We have extended the use of nanoemulsions to improve the acid stability of citral, which is one of the most important flavor compounds in citrus oil and a natural flavor ingredient with very high consumer acceptance. However, citral is known to be unstable under acidic conditions, limiting its application in the beverage and fragrance industry. Our results demonstrated the improved pH stability of citral in solid lipid nanoparticles compared to traditional emulsions.

**ThM5 Isolation and quantitative detection of silver nanoparticles in food with nano-pore phase inverted poly(amic acid) membranes** 1. State University of New York at Binghamton, Department of Chemistry, Binghamton, 1. Nian Du<sup>1</sup>, ndu1@binghamton.edu 2. Michael M. Feurstein<sup>1</sup>, 3. Omowunmi A., osadik@binghamton.edu There is urgent demand for rapid screening methods to isolate, detect, and monitor engineered nanomaterials in foods and the environment. Conventional methods for characterizing nanomaterials such as transmission electron microscopy, scanning electron microscopy and atomic force microscopy suffer from many disadvantages. Thus a new, radical approach is needed to monitor these emerging contaminants to protect human health and the environment. In our laboratories, we have prepared a new class of phase inverted copolymers of polyamic acid (PAA). In preliminary tests, PAA materials were used for the isolation of quantum dots from aqueous solutions and they showed excellent performance not only for isolation but also as a platform for detection of nanoparticles. In this presentation, we will demonstrate rapid and easy method to isolate and detect AgNPs from food beverages and simultaneously characterize their size range by utilizing nano-pore phase inverted poly(amic acid) membranes.

## **THURSDAY MORNING March 25 Section B**

### **General Papers**

Michael Appell, Organizer      Kotamballi Chidambara, Murthy, Neil Da Costa, Presiding

9:00 Introductory Remarks.

9:05 270. Sustainability from agricultural wastes: Chiral ligands from oligomeric proanthocyanidins via acid depolymerization. D. Huang, C. Fu, W. Chen, Y. L. Quek, W. Y. Leong, A. B. A. Ghani, R. Ni

9:30 271. Effect of wine closure oxygen permeability on volatile sulfur compounds in pinot noir and chardonnay wines during post-bottle aging. J. He, J. Peck, R. Soles, A. Marin, M. Qian

9:55 272. Measuring gas-liquid partition coefficients of aroma compounds by Solid

Phase Microextraction, sampling either headspace or liquid. N. W. Lloyd, S. E. Ebeler, S. R. Dungan

10:20 Intermission.

10:40 273. Derivatives of alkyl gallates: The actual inhibitor for the soybean lipoxygenase-1. M. Ikeura

11:05 274. Synthesis of [5-<sup>14</sup>C<sub>3</sub>]-(<sup>2</sup>R, <sup>4'</sup>R, <sup>8'</sup>R)- $\alpha$ -tocopherol for in vivo human metabolic studies. H. D. L. Matel, J. Chuang, D. Holstege, A. J. Clifford, K. P. Nambiar

**ThM2 Sustainability from agricultural wastes: Chiral ligands from oligomeric proanthocyanidins via acid depolymerization**, 1.

National University of Singapore, Department of Chemistry, Singapore, chmhdj@nus.edu.sg. 2. Caili Fu, 3. Wei Chen, 4. Yi Ling Quek, 5. Wen Yi Leong, 6. Amylia Bte Abdul Ghani, 7. Runyan Ni. Under-utilized natural products particularly those from agricultural and forestry wastes may contribute the sustainable fine chemicals if they can be transformed into more definitive structures with specific functions. One such natural product is oligomeric proanthocyanidins (OPCs), or catechins/epicatechins oligomers. We have converted B-type OPCs isolated from mangosteen peels into wide range of 4(b) substituted epicatechin derivatives through acid depolymerization in the presence of wide range carbon and sulphur nucleophiles. These nucleophiles include 2,3-dimethyl pyrrazole; 3-ethyl-2,4-dimethylpyrrole, or 3,4-diethylpyrrole, 3,5-dimethoxyphenol, or, 3,5-dimethoxyaniline, o-thioaniline, cysteamine; 1,2-dithioethane.

**ThM3 Effect of wine closure oxygen permeability on volatile sulfur compounds in pinot noir and chardonnay wines during post-bottle aging**, 1.

Oregon State University, Department of Food Science and Technology, Corvallis, Oregon, 1. Juan He, 2. Juan He@oregonstate.edu, 3. Jim Peck, 4. G3 Enterprises, Department of Closure Division, 500 S. Santa Rosa Avenue, Modesto, CA jim.peck@g3enterprises.com, 5. Rollin Soles, 6. Argyle Winery, Dundee, OR, rollin@argylewinery.com, 7. Anna Marin, Oregon State University, Food Innovation Center, Portland, OR, 8. Michael Qian, Michael.Qian@oregonstate.edu. It is generally accepted that bottled wine is a dynamic system. A proper wine bottle closure will allow a dynamic and healthy gas exchange between the wine and the air. The amount of oxygen ingress through the wine closure can directly affect wine aging and flavor development. Too much oxygen ingress can oxidize the wine during post-bottle aging, whereas too little oxygen ingress may slow flavor development or even induce "reduced" off-flavor. Natural cork (up and down), synthetic, and screw caps with Saran-Tin, Saranex and low density polyethylene (LDPE) lines were investigated on both Pinot noir and Chardonnay wines over two years storage. For Chardonnay wine, the LDPE screw cap gave the highest dissolved oxygen, lowest free SO<sub>2</sub>, and highest absorbance at 420 nm. The Saran-Tin screw cap gave the lowest dissolved oxygen. Similar trends were observed for Pinot noir wines, with Saran-Tin screw cap gave the lowest dissolved O<sub>2</sub> and highest free SO<sub>2</sub> and total SO<sub>2</sub>. A reduction of methanethiol was observed for wines with LDPE screw cap and synthetic closures, however, we did not detect any elevated sulfur compounds for any screw cap closures, and we did not detect any dimethyl disulfide and dimethyl trisulfide in any of the experimental wines. Sensory analysis did not pick up any aroma difference between the Saran-Tin and LDPE screw capped wines.

**ThM4 Measuring gas-liquid partition coefficients of aroma compounds by Solid Phase Microextraction, sampling either headspace or liquid**, 1.

University of California, Davis, Department of Chemical Engineering and Materials Science, 2. University of California, Davis, Department of Viticulture and Enology, 3. University of California, Davis, Department of Food Science and Technology, 1. Nathan W Lloyd, nwlloyd@ucdavis.edu, 2. Susan E Ebeler, 3. Stephanie R Dungan. The equilibrium partitioning of hydrophobic analytes was analyzed using solid phase microextraction (SPME) in the headspace (HS-SPME) and via direct immersion in the liquid (DI-SPME). The compounds studied serve as models for aroma compounds covering a range of four orders of magnitude in air-water partition coefficient,  $K_{vl} = cv/cl$ , from 0.02 to 30. By varying the total amount of analyte as well as the ratio of vapor to liquid in the closed, static system,  $K_{vl}$  can be determined without the need for an external calibration, eliminating many potential systematic errors.  $K_{vl}$  determination using DI-SPME in this manner has not been demonstrated before. There was good agreement between results determined by DI-SPME and by HS-SPME over the wide range of partitioning behavior studied. This shows that these two methods are capable of providing accurate, complementary measurements. Precision in  $K_{vl}$  determination depends strongly on  $K_{vl}$  magnitude and ratio of phases.

**ThM6 Derivatives of alkyl gallates: The actual inhibitor for the soybean lipoxygenase-1** 1.

University of California, Berkeley, Nutritional Science and Toxicology, Berkeley, California, 1. Maki Ikeura, University of California, Berkeley, Molecular and Cell Biology, Berkeley, CA, mikeura@berkeley.edu. Lipoxygenase is an enzyme known for its catalytic activity of lipid peroxidation. The peroxidation reaction causes the deterioration of food during storage and processing, and it may bring out potentially toxic products. Alkyl gallates with saturated tail of hydrocarbons were previously reported as an inhibitor for soybean lipoxygenase-1 during linoleic acid peroxidation. However, it is recently found that gallate compounds show pH dependence, and certain amount of gallic acid is converted to another substance in presence of ethanol and Tris-HCl buffer (pH 8) using high performance liquid chromatography. There is a possibility that this new substance is actually the inhibitor for the soybean lipoxygenase-1. Additionally, alkyl 3,4-dihydroxybenzoates are also investigated for their structural similarity to alkyl gallates.

**ThM7 Synthesis of [5-<sup>14</sup>C<sub>3</sub>]-(<sup>2</sup>R, <sup>4'</sup>R, <sup>8'</sup>R)- $\alpha$ -tocopherol for in vivo human metabolic studies** 1.

University of California, Department of Chemistry, Davis, CA, 2. University of California, Department of Nutrition, Davis, CA, 3. University of California, Agriculture and Natural Resources Analytical Laboratory, Davis, CA, 1. Hosea dL Matel, University of California, Chemistry Davis, CA, hdmatel@gmail.com 2. Jennifer Chuang, 3. Dirk Holstege, 4. Andrew J Clifford, 5. Krishnan P Nambiar. We report an efficient one-pot two-step synthesis of C-14 labeled R, R, R- $\alpha$ -tocopherol using  $\alpha$ -tocopherol as starting material. The first step involves the formation of a methyl morpholine derivative of  $\alpha$ -tocopherol using C-14 formaldehyde, morpholine and  $\alpha$ -tocopherol in benzene under reflux at 80 °C for 12 h followed by reduction with sodium cyanoborohydride in isobutanol-benzene under reflux for 4 h to reduce the methyl morpholino derivative to R, R, R- $\alpha$ -tocopherol. Work-up with glacial acetic acid to remove excess reducing agent and extraction with diethyl ether were done to recover the product. Reversed phase HPLC using 90% ethanol in water was carried out to purify the product. The identity of C-14 labeled R, R, R- $\alpha$ -tocopherol was confirmed by <sup>1</sup>H and <sup>13</sup>C NMR and the mass by MS. Stereochemistry was confirmed by chiral HPLC. Specific activity was 46.8 mCi/mmol with a total yield of 90%.

## THURSDAY AFTERNOON March 25 Section B

### General Papers

Michael Appell, Organizer Alyson Mitchell, Michael Appell, Presiding

1:00 Introductory Remarks.

1:05 275. Pressurized hot ethanol extraction of carotenoids from carrot waste. A. Mustafa, C. Turner

1:30 276. Column clean-up protocols (polymeric-based C18 and antibody-based immunoaffinity cartridges) and spectroscopy detection methods HPLC/U.V./Fluorescence and LC/MS/MS) for analyzing multi-analyte mycotoxins.

D. Siantar, R. Masschelin, S. Cardozo, M. Galicia, N. Hill, A. Mabud

1:55 277. Study of cyclodextrin-based polymers to extract patulin from apple juice. M. Appell, M. A. Jackson

2:20 Concluding Remarks.

**ThA2 Pressurized hot ethanol extraction of carotenoids from carrot waste** 1. Uppsala University, Analytical Chemistry, Uppsala, Sweden 1. Arwa Mustafa1 ,Arwa.Mustafa@kemi.uu.se 2. Charlotta Turner1 ,Nutraceuticals and functional food ingredients are known to improve individual health, with especial emphasis age related diseases [1, 2]. Carotenoids are known for their antioxidant activity and therefore have a neuroprotective effect. They are reported to control a wide range of cancers and improve cognitive development [2]. One of the rich sources for carotenoids are carrots. However, market policies indicate that carrots should meet strict standards of size and shape, this makes about 25% of carrots go as waste [3]. The aim of this study was to make use of waste carrots by extracting carotenoids from them. Nevertheless, conventional extraction methods of carotenoids require the use of organic solvents, which are costly, environmentally hazardous, and require expensive disposal procedures. This fact has extended the objective of this study to optimizing a sustainable technology extraction procedure for carotenoids. Pressurized liquid extraction (PLE) utilizes conventional solvents at elevated temperatures and pressure, it requires less solvent in a shorter period of time, the set-up of the technique contains samples in an oxygen and light-free environment makes it preferable for use in the nutraceutical industry [4, 5]. The extraction solvent of choice was ethanol since it is generally recognized as safe (GRAS). The extraction procedure was optimized by varying the extraction time (2 - 10 min) and the temperature (60-180 °C).  $\beta$ -carotene is the most abundant form of carotenes in carrots (60 - 80 %), and hence in this study it was used as an indicator for carotenoids content in carrot waste. Preliminary results show that the content in carrots is 42.6  $\mu\text{g/g}$  DW, which is within the range of the reported values (37 - 78  $\mu\text{g/g}$ ). Since carotenes are lipophilic, the effect of adding oil to the extraction was also studied.

**ThA3 Column clean-up protocols (polymeric based C18 and antibody based immunoaffinity cartridges) and spectroscopy detection methods HPLC/U.V./Fluorescence and LC/MS/MS) for analyzing multi-analyte mycotoxins** 1. U.S. Department of the Treasury, Alcohol and Tobacco Tax and Trade Bureau Scientific Services Division, Walnut Creek, CA, 1. Darsa Siantar1 , Darsa.Siantar@ttb.gov 2. Ryan Masschelin1 , 3. Sarita Cardozo1 , 4. Marsha Galicia1 , 5. Norma Hill1 , 6. Abdul Mabud1 , Beers and wines are typically produced by fermenting various cereal grains and fruits, respectively. These agricultural raw materials are also the prime substrate for mold growth and mycotoxin contamination. Because mycotoxins can potentially be introduced into various foods through raw materials, affecting food safety, analysis of these toxins in various finished products is critical. Mycotoxin sample preparation techniques using polymeric-based C18 and monoclonal antibody-based immunoaffinity clean-up columns were investigated. Two distinct analytical methods, HPLC/U.V./Fluorescence and LC/MS/MS for analyzing multiple mycotoxins in alcoholic beverages, such as wines and beers had been developed. The advantages and disadvantages of using different sample preparation and analytical techniques will be discussed.

**ThA4 Study of cyclodextrin-based polymers to extract patulin from apple juice** 1. USDA-ARS, National Center for Agricultural Utilization Research, Bacterial Foodborne Pathogens & Mycology Research, Peoria, IL, 2. USDA-ARS, National Center for Agricultural Utilization Research, Renewable Resource Technology Research, Peoria, IL 1. Michael Appell1 , USDA-ARS-NCAUR, Bacterial Foodborne Pathogens & Mycology Research, Peoria, IL, michael.appell@ars.usda.gov 2. Michael A Jackson2 , Synthetic sorbents offer a means to develop more robust materials to detect analytes in complex matrices, including methods to detect naturally occurring contaminants in agricultural commodities. Patulin is a mold metabolite associated with rotting apples and poses health risks to humans and animals. Beta-cyclodextrin-based polyurethane polymers were synthesized and evaluated for the ability to bind the toxin patulin under aqueous conditions. Freundlich isotherm analysis indicates a degree of heterogeneity in the affinity of the binding site population. Crosslinked polymers with tolylene 2,4-diisocyanate were suitable for the solid phase extraction and LC-analysis of patulin from apple juice. Studies of binding modes of patulin with the  $\beta$ -cyclodextrin component using the PM3 semi-empirical method identified several preferred complexes possessing intermolecular hydrogen bond interactions. These nanoporous polymers exhibit favorable properties to assist the detection of patulin in aqueous solutions.

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