



CORNUCOPIA

including AGFD abstracts for the
241th American Chemical Society National Meeting

March 27 - 31, 2011

in

ANAHEIM

ALYSON MITCHELL, Program Chair

note to readers

As the use of PDAs, netbooks, and I-Pads accelerates, paper communications sent via surface mail, like *the Cornucopia*, run the risk of becoming irrelevant. The Editors are considering posting *the Cornucopia* for download on the AGFD website 6-8 weeks prior to national meetings and no longer mailing the printed version.

Print copies would still be available at national meetings.

Feedback (to carl.frey@pepsico.com) regarding this proposal is encouraged.



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visit our website: <http://agfd.sites.acs.org> - for a pdf of *the Cornucopia* and much more

deadline for submission of content for next Cornucopia: May 15

MESSAGE FROM THE CHAIR

The Fall 2010 ACS National Meeting in Boston MA was a tremendous success for the Division of Agricultural and Food Chemistry (AGFD). Boston's vibrant atmosphere proved once again to be an excellent location to foster the exchange of scientific knowledge. Our division offered an excellent 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, ACS staff and active AGFD members for their tireless contributions towards making this a successful program.

The 241st ACS National meeting to be held in Anaheim CA is expected to be well attended and offers several symposia supporting the International Year of Chemistry.



I would like to express my deep gratitude to the AGFD executive committee, symposium organizers and ACS staff for their tireless efforts and numerous contributions that make AGFD the terrific division that it is. The new PACS system offered us all unique challenges, which I believe served as a great reminder that forward growth is often a painful process requiring extra patience and understanding. I would like to acknowledge and thank our Cornucopia editor, Carl Frey, Cynthia Mussinan (treasurer), Michael Tunick (secretary) and Faria Tokadoski (ACS) for their patience and guidance with the program and other duties. Lastly, I would like to thank my AGFD family, and especially past chair, Mike Appell and chair-elect, Neil Da Costa for their guidance and support during a very challenging time in my life. I could not have done this without their support. These outstanding individuals have made volunteering for ACS and AGFD an enjoyable and rewarding experience.

Alyson Mitchell
aemitchell@ucdavis.edu

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FUTURE PROGRAMS

**Organizing a symposium?
Check out the centerfold for useful tips.**

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 - Michael Appell USDA-ARS-NCAUR michael.appell@ars.usda.gov Alyson Mitchell, U. of Calif., Davis aemitchell@ucdavis.edu Neil Da Costa, International Flavors and Fragrances neil.dacosta@iff.com

Future Agricultural Consumer Safety Demands for the Global Market (co-sponsored by AGRO) - Aristobulo Loaiza, BASF Corporation aristobulo.loaiza@basf.com

Aquaculture and Aquaculture Feed - Agnes Rimando USDA ARS NPURU agnes.rimando@ars.usda.gov; Fereidoon Shahidi, Memorial University of Newfoundland, Department of Biochemistry fshahidi@mun.ca Kevin K. Schrader; USDA ARS NPURU kschrade@olemiss.edu

Food for Extreme Environments - 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 Lauren S. Jackson FDA National Center for Food Safety & Technology Lauren.jackson@fda.hhs.gov

Recent Advances in Analysis of Food and Flavor s - Cynthia Mussinan International Flavors and Fragrances cynthia.mussinan@iff.com Steven Toth International Flavors and Fragrances stephen.toth@iff.com

Sterling Hendricks Memorial Lecture (co-sponsored by AGRO & AGFD) - Michael H. Tunick, Dairy Processing & Prod. Res. Unit, USDA michael.tunick@ars.usda.gov Kim Kaplan, USDA, Beltsville, MD kim.kaplan@ars.usda.gov Stephen O. Duke, Natural Prod. Utilization Res. Unit USDA sduke@olemiss.edu

Tropical Fruits: Flavors, Color and Health Benefits - Bhimu Patil, Vegetable & Fruit Improvement Ctr, Texas A&M Univ. b-patil@tamu.edu Kanjana Mahattanatawee, Dept of Food Tech. Siam Univ. Thailand kanjana@siam.edu Coralia Osorio, Dept of Chem. Univ. Nacional de Colombia cosorior@unal.edu.co Guddadarang Jayaprakasha Vegetable & Fruit Improvement Ctr Texas A&M Univ gjayaprakasha@ag.tamu.edu

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

Nitrogen and the Human Endeavor: Chemistry, Effects and Solutions (co-sponsored by Environ Chem)

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

SAN DIEGO - March 25 - 29, 2012

Carotenoid Cleavage Products - Peter Winterhalter, Technische Universität Braunschweig p.winterhalter@tu-bs.de Sue Ebeler, U. of California - Davis seebeler@ucdavis.edu Russell Rouseff U. of Florida RLR@crec.ifas.ufl.edu

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

Hispanic Foods co-sponsored by AGRO - 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.

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

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Undergraduate Symposium - Charles Brine, CJ Brine and Associates brinec11@verizon.net

ACS National Meeting Theme for Spring 2012, San Diego - Chemistry of Life.

PHILADELPHIA - August 19 - 23, 2012

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

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

Essential Oils: Natural Materials for Flavor, Fragrance and Bioactives - 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

Instrumental Methods for the Analysis of Bioactive Molecules (co-sponsored by AGRO) - G. K. Jayaprakasha; Texas A&M University gjayaprakasha@ag.tamu.edu Bhimu Patil; Texas A&M University b-patil@tamu.edu

Snack Foods - Fereidoon Shahidi Memorial Univ. of Newfoundland, Dept. of Biochemistry fshahidi@mun.ca

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

ACS National Meeting Theme for Fall 2012, Philadelphia - Chemistry of Air, Space, and Water.

Other PROGRAMS and SYMPOSIA - unscheduled or beyond 2012

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

Colorants and Pigments - Fereidoon Shahidi, Memorial University of Newfoundland, Department of Biochemistry fshahidi@mun.ca Kazuo Miyashita Hokkaido University kmiya@fish.hokudai.ac.jp

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, LSU JFinley@agcenter.lsu.edu

Urban Agriculture (AGRO-cosponsor) - Michael Appell, USDA-ARS michael.appell@ars.usda.gov

SAVE THE DATES

May 28 to June 1, 2012



AGFD invites you to visit the beautiful Greek Isles for the **2012 International Flavor Conference**



A pre-conference ISNFF workshop on nutraceuticals and functional foods is also scheduled for May 26-28.

Look for more details in the next newsletter and online at www.emich.edu/flavor



Join us in Greece in 2012 OPA!!!

AGFD Executive Committee MEETING MINUTES

Sunday, August 22, 2010

Boston Convention and Exposition Center, Boston, MA

Takes place at each ACS National Meeting

Attendees: Michael Appell, Charles Brine, Keith Cadwallader, Neil Da Costa, John Finley, Carl Frey, Kevin Goodner, Chi-Tang Ho, Luke Howard, Lauren Jackson, Guddadarang Jayaprakasha, Jane Leland, Robert McGorin, Kotamballi N.C. Murthy, Michael Morello, Cynthia Mussinan, Richard Petroski, Agnes Rimando, Sara Risch, Mathias Sukan, Stephen Toth, Michael Tunick, Lucy Yu

AGFD Chair Mike Appell called the meeting to order at 5:14 p.m.

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

Cynthia Mussinan gave the **Treasurer's Report**. The Division allotment, which is based on the two highest attended technical sessions, number of posters presented, and other factors, was \$28,000. The donations were \$7754 and the book royalties were \$5819, both low figures. The investment subcommittee suggested not moving money into different accounts.

Mike Appell noted in the **Program Report** that the Anaheim ACS program in March 2011 was going to be large and space tight. The AGFD budget for that meeting was set at \$22,500, based on \$750 for each of 30 sessions. The Young Scientist Award Symposium and the new Undergraduate Award Symposium were funded by ACS grants this year, but their sustainability was questioned since the Division would be paying for the travel and the cash awards in the future. Mike Morello moved that the Undergraduate program continue for 2011, but that the money for it be reduced in 2012 if another funding source is not identified. Sara Risch made a similar motion for the Young Scientist program. Both motions passed. Charlie Brine, who created both programs, will form a subcommittee to seek funds. Sara Risch said that there may be a PMSE symposium on recycling PET bottles, and that AGFD will be contacted about participating. Neil Da Costa will move the Future Programs meeting to Monday at 5 p.m. to boost attendance, and will have it advertised at the technical sessions. John Finley said that **Biotechnology Secretariat** will follow the thematic programming and that postdocs will be encouraged to organize BTEC symposia for the regional meeting. Keith Cadwallader of the **Multidisciplinary Program Planning Group** said that themes for future meetings have been identified and that we will try to align programs with them when possible.

Sara Risch gave the **Councilor's Report**. There is a possibility of moving the Council meeting from Wednesday morning to Tuesday morning so people in governance who arrive the previous week don't have to stay an extra day. Some committee positions are open for members who are not Councilors. Mike Morello, who is rotating off the Meetings and Expositions Committee, said that more than 9000 person-hours have been devoted to improving the PACS abstract system for this year's meetings. ACS may look at other systems if there is no significant improvement by the Anaheim meeting. Boston has 7960 abstracts and 12,777 preregistered, which is not as large as expected.

The **Award** for the Advancement of Application of Agricultural and Food Chemistry will be presented to Terry Acree, and the AGFD Fellow Award has been won by Keith Cadwallader. The Roy Teranishi Graduate Fellowship in Food Chemistry will not be given this year due to a lack of qualified applicants. The next Sterling Hendricks Award will be presented in Denver in August 2011, when AGRO meets next. The Undergraduate Award winner will be announced at the award banquet (note: it was won by Melanie Krook, Miami University, Oxford, OH). The Young Scientist Award will be also be revealed at the banquet (it was won by Danielle DiNallo, IFF, Union Beach, NJ). For the first time, AGFD was nominated

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for an ACS ChemLuminary Award for Innovation and Outstanding Service to Members of a Division. Neil Da Costa reported that the results will be announced at the award ceremony Tuesday evening at the same time as our banquet, and that a Division representative will attend (note: AGFD won). Mike Appell reported that AGFD has seven members named as ACS Fellows this year: Terry Acree, Chi-Tang Ho, George Inglett, Attila Pavlath, James Seiber, Fereidoon Shahidi, and Les Sperling.

Cornucopia editor Carl Frey said that he had trouble downloading abstracts from PACS. He and Mike Appell had to download each of the 242 abstracts individually, which delayed printing. Publishing and mailing the newsletter costs \$7500-8000 per issue, including the 300 copies made available at the national meeting. It is available on our website immediately. We are thinking about phasing out the mailing of Cornucopias except by request. The Cornucopia contains the paper ballot required by our by-laws for Councilor elections, but the page can be accessed online, printed out, and mailed. ACS allows electronic balloting, but the Division would have to change its by-laws to permit it.

Hospitality/Public Relations Chair Charlie Brine has arranged an expanded banquet for this meeting, in which Terry Acree will be honored.

Membership Chair Lucy Yu said that AGFD had 20 members celebrating their 25-year anniversaries with the division and 2948 total members, which appears to be an all-time high.

Mike Appell read the **Nominations**: Lauren Jackson, Vice-Chair, Neil Da Costa, Chair-Elect, Alyson Mitchell, Chair, Cynthia Mussinan, Treasurer, and Michael Tunick, Secretary.

Jim Seiber's **Journal** report was read by Mike Appell. They are continuing international outreach and partnering with Environmental Science and Technology on a virtual issue on biotechnology. A strategic planning session will occur later this year. Charlie Brine said that a special issue containing the papers in Terry Acree's symposium will be published.

Mike Appell has been working with Victoria Finkenstadt on the **Website**. It now has the ACS brand on it, and monthly updates are needed.

In **New Business**, Mike Appell said that the ACS Network has the ability to interact with those who cannot attend national meetings, and that online meetings can be held. Neil Da Costa will attend a meeting on next year's International Year of Chemistry. Agnes Rimando will try to establish a tie-in with a local section. Mike Appell listed improvements in PACS and Neil Da Costa said that there is an October deadline for Anaheim abstracts. Symposium organizers will be notified of this. Mike Appell read a letter suggesting five ACS Awards committees that AGFD members could serve on. Mike Morello reported that the Leadership Conference and Program Planning and Coordination Conference are coming up and that we are sending Lauren Jackson and Neil Da Costa.

The meeting adjourned at 7:12 p.m.

Submitted by Michael Tunick, AGFD Secretary



AGFD Treasurer Cynthia Mussinan with Refreshment Chair, Steve Toth.

Minutes of the Ag and Food Chemistry Divison Annual Business Meeting

Tuesday, August 24, 2010

Boston Convention and Exposition Center, Boston, MA

Takes place at each Fall National Meeting, and is open to all AGFD members

Attendees: Valeria Acquarone, Michael Appell, Charles Brine, Keith Cadwallader, Neil Da Costa, Kathryn Deibler, Carl Frey, Eckhard Hellmuth, Lauren Jackson, Mathias Sucan, Robert McGorin, Michael Morello, Cynthia Mussinan, Richard Petroski, Ruowei Strange, Stephen Toth, Jun Tulio, Michael Tunick

AGFD Chair Michael Appell called the meeting to order at 12:17 p.m. A summary of the Executive Committee meeting was presented. The following points also brought up:

Treasurer: Cynthia Mussinan reported that since the Executive Committee meeting the Division received \$2100 in royalties from e-books. These are our symposium series books and book chapters ordered online or accessed by library subscriptions. Mike Appell said that ACS books are now searchable on the same site as ACS journals.

Program: The Future Programs meeting has been held.

Cornucopia: Carl Frey found that newsletters can be printed on-site for \$10 each. In the next issue he will have a front page statement about switching to electronic issues. It should be possible to have the Cornucopia online with access by AGFD members only, as a benefit of Division membership.

Nominations: Mike Appell read the slate of officers for the Division for 2011:

Alyson Mitchell, Chair
Neil Da Costa, Chair-Elect
Lauren Jackson, Vice-Chair
Cynthia Mussinan, Treasurer
Mike Tunick, Secretary

There were no nominations from the floor. The slate passed unanimously. Mail-in ballots for Councilor are being received.

Flavor Subdivision officers for 2011 will be:

Kotamballi N.C. Murthy, Chair
Kevin Goodner, Chair-Elect
Gavin Sacks, Vice-Chair
open, Secretary

Functional Foods & Natural Products Subdivision officers for 2011 will be:

Guddadarang Jayaprakasha, Chair
Navindra Seeram, Chair-Elect
Gene Lester, Vice-Chair
Luke Howard, Secretary

New Business: A two-page guide for organizing symposia will be printed for the next Future in Programs meeting. Neil Da Costa attended PACS training; they are still working out the bugs. Some attendance thought that the abstract deadline for Anaheim was too soon, but Mike Morello pointed out that the deadline is set by the publication schedule. Some AGFD members who might want to serve on ACS awards committees were identified.

The meeting adjourned at 12:55 p.m.

Submitted by Michael Tunick, AGFD Secretary

AWARD NEWS

ACS Fellow Awards

At the Boston ACS Fall Meeting in August, AGFD had the distinction of having seven members chosen as ACS Fellows for 2010. Those so honored are: Attila E. Pavlath, *USDA/Western Regional Research Center*, Chi-Tang Ho, *Rutgers University*, Fereidoon Shahidi, *Memorial University of Newfoundland*, George E. Inglett, *USDA/ARS/National Center for Agricultural Utilization Research*, James N. Seiber, *University of California, Davis*, Leslie H. Sperling, *Lehigh University* and Terry E. Acree, *Cornell University*.

The selection of these ACS Fellows is especially noteworthy in that this is only the second year the Fellow Award has been conferred by ACS. The ACS Fellow Award recognizes sustained research excellence and significant scientific contributions over a career. Competition for this recognition is substantial since there are numerous ACS Past-Presidents, Nobel Prize laureates and other distinguished scientists in the running for Fellow Awards. All the more, these awards point out the noteworthy achievements of the AGFD awardees and the high caliber of their scientific contributions. AGFD congratulates these members on their prestigious awards and notable research achievements. We are confident that their high level of scientific contributions will continue into the future.

Award for Advancement of Application of Agricultural and Food Chemistry

Prof. Terry E. Acree, Cornell University, received the 2010 Award for Advancement of Application of Agricultural and Food Chemistry. This prestigious award, which consists of \$3000, a plaque and meeting travel expenses, is sponsored by International Flavors & Fragrances and administered by AGFD. It was presented to Prof. Acree at the AGFD Awards Banquet in August during the 240th ACS Meeting in Boston.

Prof. Acree is an internationally recognized research leader in flavor chemistry and sensory analysis. He has pioneered research on analytical methods and protocols for identifying flavors (e.g., GCO, CHARM Analysis) that are now utilized around the world in both academia and industry. His work has resulted in more than 175 research papers, 6 ACS Symposium Series Books, numerous chapters in conference proceedings, books and patents. He has organized many symposia, conferences, and Flavor Workshops and is an active member of several professional scientific societies. He has been a highly regarded teacher during his tenure at Cornell where he has advised 27 Masters and Ph.D. recipients, 9 post-doctoral fellows and has hosted numerous visiting scientists. He is an AGFD Fellow and has been the advisor/professor of AGFD Graduate Research awardees. This year he was elected to the prestigious position of ACS Fellow.

The officers and membership of AGFD congratulate Prof. Acree on his selection for this prestigious award and look forward to the continuance of his outstanding career.



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AGFD's First ACS ChemLuminary Award!

AGFD won the 2010 ChemLuminary Award in the category of Recognition of Innovation and Outstanding Service to Members of a Division for its Young Scientists Award Symposium. ACS ChemLuminary Awards recognize excellence in achievements by ACS Local Sections and Divisions. Flavor Subdivision Chair Kotamballi N.C. Murthy accepted the award for AGFD at the national meeting in Boston. AGFD sponsors the Young Scientist Award Symposium, which is partially supported by an ACS Innovative Projects Grant, to attract outstanding young scientists in food-related fields to ACS National Meetings. The symposium, organized by Charles Brine, is highly attended and known for presentations of exceptional technical quality.

2010 AGFD Young Scientist Award

Danielle DiNallo, IFF Research & Development Dept., won the 2010 AGFD Young Scientist Award for her work on *Analytical techniques ensure performance and quality of encapsulates*, which she delivered at the National Meeting in Boston. This is the second year that the AGFD program showcased the research talents of outstanding young scientists within 12 years of their last degree in the fields of study encompassed by AGFD. Danielle received a \$1000 cash award, an engraved commemorative plaque and travel expenses to Boston to deliver her presentation. AGFD congratulates Danielle on her achievement of this prestigious award and hopes it will stimulate continued excellence in her future research. The fall ACS National Meeting in Denver will feature the next AGFD Young Scientists Award Symposium.

2011 ACS Innovative Project Grant Award for AGFD

AGFD won a 2011 ACS Innovative Project Grant Award for its Undergraduate Student Research Award Program. ACS provides \$7500 of support funding with this award. This program features an Annual Research Award Symposium designed to highlight the research talents of undergraduate students, provide a professional forum for presentation of their research results and promote their continued education in food & agricultural chemistry. Charles Brine organizes the program and the associated Award Symposium. This marks the 4th such award, 3rd consecutive year and 2nd time that ACS has awarded grants for the AGFD Undergraduate Student Research Program. Find details on all AGFD awards at <http://agfd.sites.acs.org/>

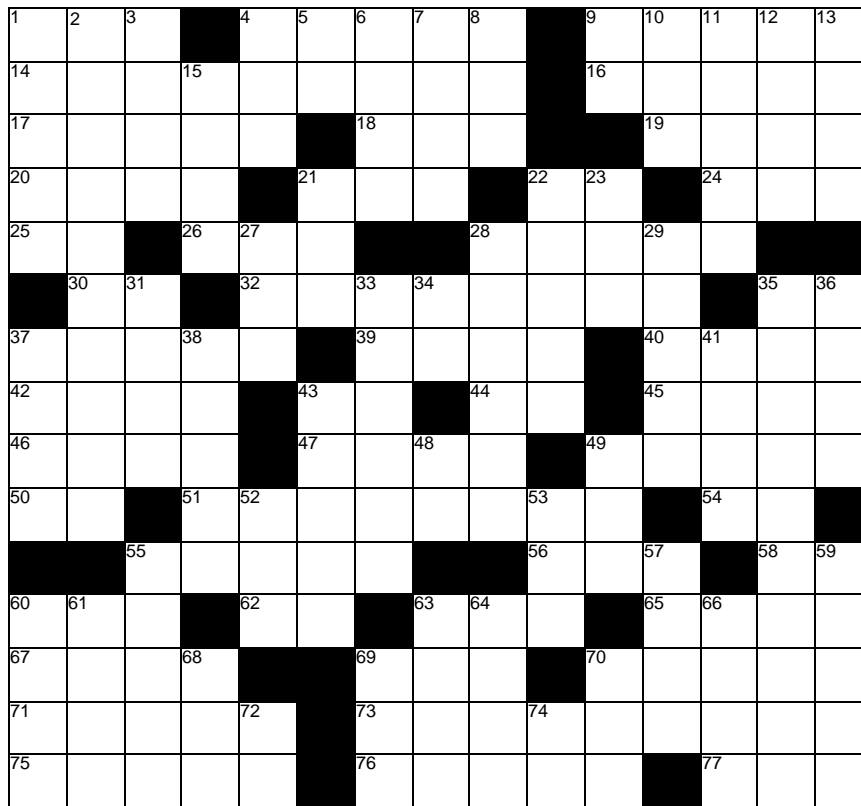
2010 Undergraduate Student Research Award

With the support of an ACS Innovative Project Grant, AGFD sponsored an Undergraduate Student Research Award Symposium at the Boston ACS Meeting. The symposium provides a national showcase for undergraduate students that have achieved research excellence in agricultural and food science. The winner of the 2010 symposium is Melanie A. Krook, Dept. of Chemistry, Miami University, Oxford, OH for her work - *Stability of dietary phenolics under gastrointestinal conditions*. Melanie received a \$500 cash award, a commemorative plaque and travel expenses to Boston to deliver her presentation. AGFD applauds the high quality of her research and trusts her award will inspire continued research excellence and a promising career in the field.

correction

Due to a blunder on the part of the otherwise crack *Cornucopia* editorial staff the covers of mailed copies of the Fall 2010 *Cornucopia* contained an error - listing Michael Appell as Program Chair when in fact Alyson Mitchell served as program chair. The error was caught in early enough to correct copies distributed at the Boston meeting but too late to recall the mailed paper copies. The Fall 2010 *Cornucopia* as it presently appears on the AGFD website is correct.

PUZZLE TIME IN ANAHEIM



A prize to the first to fax
a correct solution to:

Carl Frey at

914-749-3329

Congratulations to the
winner of the coveted

Fall 2010 prize -

Peter Given

of Pepsi-Cola R&D

ACROSS

- 1 layer
4 many crossword entries
9 tasty drinks (w/75 across)
14 LA to San Diego road
16 group of 3
17 You ---- for it!
18 poem of praise
19 Henry's second or fourth
20 density times volume
21 '--- alive!' (line from
Young Frankenstein)
22 dental office syllable
24 medicates to excess
25 short for tin
26 Chinese philosophy/path
28 trick alternative
30 volatile separation device
32 ratatouille component
35 trucker's radio
37 really cool, man!
39 kudos to a matador
40 reminder of a bad scrape
42 HP's birthplace: Palo ----
43 -- Segundo or -- Capitan

- 44 you and me
45 easy gait for a horse
46 comment from an alley
47 bud of Tigger and Roo
49 moreso it is now digital
50 element of a genius
51 you and me and them
54 many questionnaire entries
55 hightails it
56 energy transfer coenzyme
58 contemplation technique
60 you and me and them
62 many questionnaire entries
63 the tube's 24hr info station
65 ---- cadabra
67 one year in four does this
69 1985's: *We --- the World.*
70 J.K. Jerome's *Three
Men in ----.*
71 Madonna's musical film
73 Santa Ana, CA airport
75 see 9 across
76 where there's ----, there's
a way.
77 distress call

DOWN

- 1 baby transports
2 home of the Dodgers
3 Stooge Curly laughs
4 join
5 -- *Mice and Men*
6 big 1886 Haymarket to-do
7 Netflix rentals
8 perceive
9 Chrysler's -- *Cruiser*
10 pitcher stat
11 it can be Blanc or Noir
12 much SiO₂
13 mid-March
15 typical lab chore
21 promissory note
22 start the day
23 layer
27 synthetic dye family
28 *Pinball Wizard* band
29 wedding march pathway
31 Clouseau's wacky servant
33 hues
34 volume of 100g of H₂O

- 35 swallow rendezvous:
San Juan -----
36 *La ---- tar pits*, CA fossil trove
37 rank and serial number go-with
38 can be hand, bath, or beach
41 Buffalo Bill ----
43 fencing needs
48 -- Vey!
49 Citifield player
52 former member of the military
53 --- ometor or ---tucket
55 whip
57 sunscreen ingredient
59 Australian buds
60 Guinness or Baldwin
61 opposite of dextro
63 *Peter Pan* song: *I Gotta ----!*
64 Radar O'Reilly's beverage pick
66 elementary school door sign
68 elementary school group
69 Steely Dan tune and album
70 piercing tool
72 Shakespeare's -- *You Like It*
74 parent org. of 49 Down

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 (click on Technical Divisions and then select Join a Division).

APPLICATION FOR AGFD DIVISION MEMBERSHIP (7623P)	
title	
name	
1 st address line	
2 nd address line	
city	
state	
Zip code	
country	
e-mail address	
phone	
check one	MEMBERSHIP FEE
<input type="checkbox"/>	I am an ACS member and wish to join AGFD (\$8.00)
<input type="checkbox"/>	I am not an ACS member and wish to join AGFD (\$10:00)
<input type="checkbox"/>	I am a full time student and wish to join AGFD (\$5.00)
Be cool JOIN A G F D	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

AGFD OFFICERS & COMMITTEE MEMBERS

Chair - Serves 1 year. Presides over Division meetings, & appoints committees
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Neil Da Costa
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Vice Chair - Serves 1 year. Assists Chair-elect in developing future technical programs.
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Cornucopia Editor - Edits Division newsletter.
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Councilors - Represent Division for 3 years on ACS council.
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jfinley@agcenter.lsu.edu
Michael Morello (thru '11),
mike_morello@pepsico.com
Agnes Rimando (thru '12),
agnes.rimando@ars.usda.gov
Sara Risch (thru '13),
sjsrisc@sbcglobal.net

Alternate Councilors - Substitute for Councilors that can not attend Council meetings. Serve 3 years.
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brinec11@verizon.net
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cadwlldr@uiuc.edu
Russ Rouseff (thru), rlr@crec.ifas.ufl.edu
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At-Large Executive Committee Members - Assist in management of Division. Serve 3 years.
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Awards Committee - Solicits nominations and oversees awards process.
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agscience@aol.com
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Finance - Monitors the Division's finances for 1 year. Filled by Immediate Past Chair
Michael Appell,
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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. Served by Immediate Past Chair.
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Public Relations - Publicizes Division.
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Web Master - Maintains web site.
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Vice-Chair - Gene Lester,
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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

Boston Byline



This meeting was different from others in recent memory in two major ways. Gail Tunick was not there, and the sun didn't shine. Obviously these things must be related. I'm actually surprised that Boston hasn't completely floated away. Of course, who cares if it rains all the time if you don't have anyone to play with anyway? Gail, you'd better come to Anaheim and no excuses!!!

As this meeting was in Boston, it is most appropriate to say "listen my children and you shall hear of the midnight ride of Paul Revere." She's not Paul Revere, but here is the Principeza (who is now legally my granddaughter) getting ready for her ride!!

The meeting was good and very well attended, so that's enough about that! I hope you will all be pleased to know that I have decided to bring back my photo contest. Rumor has it that the meager response to this contest in the past may have something to do with the prize, but I can't imagine that there is anyone who wouldn't want a genuine IFF pen and pencil set from 1992 (and may not work) plus an authentic hotel pen! So, here we go. Please carefully examine the photo to the right (printed with permission of the victim - I mean subject) and answer the questions - - if you can -

1. Can you identify the subject on the right?
2. Can you identify the subject on the left (creativity in naming counts)?
3. Can you identify the location?
4. How about the year?

Enter now for your once in a lifetime chance (if you're lucky) to win this outstanding prize. E-mail entries to: cynthia.mussinan@iff.com



AGFD Program, 241th ACS Nat'l Meeting, Anaheim, Mar. 27-31, 2011

AGFD Subdivisions - joint meeting	12:15 - 1:15 pm Sunday	March 27
Executive Committee meeting	5:00 - 8:00 pm Sunday	March 27
Future Programs meeting	12:15 - 1:15 pm Monday	March 28
AGFD Business meeting	12:15-1:15 pm Tuesday	March 29
Poster Session and Social Hour	2:00 - 4:00 pm Tuesday	March 29
AGFD Chair's Reception	6:00 - 8:00 pm Tuesday	March 29

AGFD technical sessions take place at the Anaheim Marriott

SUNDAY MORNING March 27 Section A Anaheim Marriott Orange County III

Withycombe-Charlambous Graduate Student Research Symposium

C. Brine, Organizer, Presiding

8:30 Introductory Remarks

8:35 1. Antiproliferative and DNA scission inhibitory activities of decorticated millets. A. Chandrasekara, F. Shahidi

9:05 2. Structure and function of milk glycolipids. H. Lee, C. Lebrilla, J. German

9:35 3. Validity of Brix for predicting flavor composition of Concord grape juice. M. M. Iyer, G. L. Sacks, O. I. Padilla-Zakour

10:05 Intermission

10:20 4. Comparing apples and onions: Distinct bioavailability of quercetin glycosides from different foods and mixture. J. Lee, D. M. Holstege, C. P. Dunne, A. E. Mitchell

10:50 5. Luminescence from extrinsic and intrinsic probes in solid state amorphous human serum albumin demonstrates solvent-protein slaving. A. R. Draganski

11:20 6. Formation of stable O/W emulsions and cold-set films by pH-shifting-treated soy proteins is attributed to the dissociation and unfolding of β -conglycinin and glycinin. J. Jiang, Y. Xiong

11:50 Concluding Remarks

SUNDAY MORNING March 27 Section B Anaheim Marriott Orange County IV

Nanotechnology for Food and Agriculture

M. Appell, B. Park, Organizers, Presiding

8:30 Introductory Remarks

8:35 7. Nano-encapsulation of polyphenols by milk caseins. S. Haratifar, G. Paliyath, K. Meckling, M. Corredig

9:00 8. Effective antifungals in the form of nanoencapsulated itraconazole . C.M. Sabliov, N. Patel, K. Damann

9:25 9. Molecular gels-based controlled release devices for pheromones. S. R. Jadhav, B. Chiou, D. F. Wood, G. DeGrande-Hoffman, G. M. Glenn, G. John

9:50 Intermission

10:10 10. Starch nanoencapsulation for aqueous dissolution of hydrophobic ingredients. S.Lim, J.Kim, E.Kim, T.Seo

- 10:35 11. Limonene partitioning and release from nanostructured matrices measured using SPME. S. R. Dungan, N. W. Lloyd, S. E. Ebeler
11:00 12. Nutritional liposomal technology: Characterization and pharmacokinetics. E. Blair, K. Goyen
11:25 13. Delivery of nutraceuticals using self-assembled chitosan-based nanoparticles. Q. Huang
11:50 Concluding Remarks

SUNDAY MORNING March 27 Section C Anaheim Marriott Platinum IV

Tree Nuts

- A. Mitchell, Organizer, Presiding F. Shahidi, Organizer
8:30 Introductory Remarks
8:35 14. Flavor chemistry of roasted peanuts. C. Ho
9:05 15. Significance of grinding methodology and extraction parameters on the assay of phytochemicals in foods and nuts. D. L. Luthria, A. Memon
9:35 16. Phenolic constituents and antioxidant capacities of U.S. pecans. R. B. Pegg, P. Greenspan, A. Kosinska, R. Amarowicz, R. R. Eitenmiller
10:05 Intermission
10:20 17. Walnuts combine superior phenolic antioxidant content and proven health benefits. J. Vinson, Y. Cai
10:50 18. Phenolics and antioxidant activity of Brazil nut. F. Shahidi, J. John
11:20 Concluding Remarks

SUNDAY AFTERNOON March 27 Section A Anaheim Marriott Orange County III

Undergraduate Student Research Award Symposium

- C. Brine, Organizer, Presiding
1:30 Introductory Remarks
1:35 19. Potential antidiabetic in vitro effect of blueberry varieties grown in southern Illinois. A. P. Lucius, M. Johnson, E. de Mejia
2:05 20. Determination of the substrate action pattern of an *Aspergillus nidulans* pectin methylesterase. J. W. Miller, P. Vasu, B. J. Savary
2:35 21. Effect of flavonoid structure on the rate of reduction of the nitrite ion. K. A. Hibshman, D. Dahlberg
3:05 Intermission
3:20 22. Inactivation of *Saccharomyces cerevisiae* in apple juice using nonthermal approaches. A. E. Moody, G. Marx, D. Bermudez, B. G. Swanson
3:50 23. Insecticidal properties of *Terminalia arjuna* against *Drosophila melanogaster*. M. Marnell, Y. Li, A. Haselton
4:20 24. Effects of storage on the anthocyanin, Vitamin C and antioxidant potential of raspberries and blackberries. S. B. Gacasan, N. Mwebi
4:50 Concluding Remarks

SUNDAY AFTERNOON March 27 Section B Anaheim Marriott Orange County IV

Nanotechnology for Food and Agriculture

- M. Appell, B. Park, Organizers, Presiding
1:30 Introductory Remarks

- 1:35 25. Robust particle-stabilized nano-emulsions. K. Persson, A. Millqvist-Fureby, I. Mira, J. Gustafsson
- 2:00 26. High gas barrier polymer-clay nano brick wall thin films as foil replacement technology for food packaging. J. C. Grunlan
- 2:25 27. New approach to capture, isolate, and detect silver nanoparticles in commercial food supplements using flexible mesoporous poly(amic) acid membranes. O. Sadik, N. Du, M. Feurstein, C. Wong
- 2:50 Intermission
- 3:05 28. Release of volatiles from amylose inclusion complexes as a function of enzyme hydrolysis. K. Kasemwong, T. Itthisoponkul, U. R. Ruktanonchai, W. Srinuanchai, J. R. Mitchell, A. J. Taylor
- 3:30 29. Increasing the association of casein micelles as natural nanodelivery systems with curcumin through static high pressure processing. S. Rahimi Yazdi, M. Corredig, S. Iametti, F. Bonomi
- 3:55 30. Bioactive compounds from okra seeds: Potential activators of sirtuin as therapeutics for age related diseases. B. Dayal, J. Desai, A. Baweja, M. Thiath, M. Lea
- 4:20 Concluding Remarks

MONDAY MORNING March 28 Section A Anaheim Marriott Orange County III

Cereal Grains: Chemistry, Nutrition, and Health

J. Awika, Organizer, Presiding V. Singh, Presiding

8:30 Introductory Remarks

8:35 31. Production and characterization of resistant starch from Hylon VII with pullulanase and heat-moisture treatment. S. Li, X. Deng, Q. Gao

9:00 32. Folate in cereals: Possibilities to enhance folate intake from cereal foods. V. Piironen, M. Edelmann, S. Kariluoto

9:25 33. Do you like fresh bread? The impact of process on selected quality and nutrition parameters — key results from the EU-FRESHBAKE project. a. LE-BAIL

9:50 34. Autohydrolysis of cereal bran for the production of feruloylated arabinoxyloligosaccharides. D. Rose, G. Inglett

10:10 35. Adding value to holy grain — providing the key tools for the exploitation of amaranth, the protein-rich grain of the Aztecs: Results from a joint European-Latin American research project. I. S. Fomsgaard, C. Añon, A. Barba de la Rosa, C. Christophersen, K. Dusek, J. Délano-Frier, J. Espinoza Pérez, A. Fonseca, D. Janovská, P. Kudsk, R. Labouriau, M. L. Lacayo Romero, N. Martínez, F. Matus, K. Matusová, S. K. Mathiassen, E. Noellemeyer, H. A. Pedersen, N. Reinaudi, H. Stavelikova, S. K. Steffensen, R. M. de Troiani, A. Taberner

10:35 Intermission

10:50 36. Immunolabelling of xylan side groups – a novel 4-O-methylglucuronic acid specific antibody. S. Koutaniemi, F. Guillon, B. Bouchet, O. Tranquet, L. Saulnier, M. Tenkanen

11:15 37. Refrigeration of prefermented bread dough: Impact on volume change and bubble distribution in dough and in baked bread. D. Gabric, F. Ben-Aissa, D. Curic, S. Chevallier, A. Le-Bail

11:35 38. Phytoestrogenic activity of sorghum with different flavonoid compositions. L. Yang, K. F. Allred, C. D. Allred, J. M. Awika, D. Dykes, L. Dykes

12:00 39. Technologies to recovery multiple coproducts in corn dry grind ethanol production. V. Singh

12:25 Concluding Remarks

MONDAY MORNING March 28 Section B Anaheim Marriott Orange County IV

Nanotechnology for Food and Agriculture

M. Appell, B. Park, Organizers, Presiding

8:30 Introductory Remarks

8:35 40. Composition and bioactivity of okra seed extracts: Effect on colon cancer cells. S.

Bolikal, B. Dayal, T. Anderson, C. desBordes, M. A. Lea

9:00 41. Encapsulation of EGCG within novel nanoparticles assembled from bioactive peptides and chitosan. B. Hu, Y. Ting, W. Tang, X. Zeng, Q. Huang

9:25 42. Biomass refining system via alkaline hydrothermal treatment technology: Catalyst development. N. S. Hansen, J. E. Panels, A. Park, Y. L. Joo

9:50 Intermission

10:05 43. Polyaniline-coated magnetic particle-based disposable biosensor for rapid extraction and detection of Escherichia coli O157:H7. E. C. Alcocilja, P. Jain

10:30 44. Surface enhanced Raman spectroscopy in rapid detection of live and dead Salmonella cells. J. Sundaram, B. Park, Y. Zhao, A. Hinton, S. Yoon, W. R. Windham, K. C. Lawrence

10:55 45. Single template detection of food-borne pathogenic bacterium Listeria monocytogenes. J. Zou, O. A. Oyarzabal, J. W. Hong

11:20 Concluding Remarks

MONDAY MORNING March 28 Section C Anaheim Marriott Platinum IV

Tree Nuts

F. Shahidi, Organizer, Presiding A. Mitchell, Organizer

8:30 Introductory Remarks

8:35 46. Relative emission patterns of ambient almond orchard volatiles and associated navel orangeworm chemoreception and in vitro ovipositional behavior. J. J. Beck, D. M. Light, B. S. Higbee, W. S. Gee, K. Dragull

9:05 47. Influence of cultivar and postharvest conditions on polyphenol content and antioxidant capacity of California almond skins. B. W. Bolling, J. B. Blumberg, O. Chen

9:35 48. Influence of roasting and varietal selection on advanced glycation end-product (AGE) formation in almonds. A. E. Mitchell, G. Zhang, G. Huang

10:05 Intermission

10:20 49. High temperature short time roasting increases phenolics content and antioxidant activity of cashew nuts. F. Shahidi, N. Chandrasekara

10:50 50. Walnut feeding changes hepatic metabolomic profile of mouse model of prostate cancer. W. Yokoyama, P. A. Davis, V. Vasu, K. Gohil, H. Kim, I. Khan, C. Cross

11:20 Concluding Remarks

MONDAY AFTERNOON March 28 Section A Anaheim Marriott Orange County III

Cereal Grains: Chemistry, Nutrition, and Health

J. Awika, Organizer, Presiding V. Singh, Presiding

1:30 Introductory Remarks

1:35 51. Overview of sorghum protein structure and cross-linking: Implications for nutritional and functional properties of sorghum. S. R. Bean

2:00 52. Effect of sorghum flavonoid composition on biomarkers of chemoprevention. J. M. Awika, L. Yang, L. Ojwang

2:25 53. Grain sorghum and metabolic health. M. D. Haub, J. A. Louk, A. Schrage, B. Craemer, S. R. Bean
2:50 54. Food contact material during baking: Technological and safety issues. a. LE-BAIL, b. VEYRAND, S. DURAND, H. KADAR, B. LE-BIZEC
3:10 Intermission
3:25 55. Cereal antioxidant dietary fibre for weight management and prevention of chronic disease. V. Fogliano, P. Vitaglione
3:50 56. Comparison of micellar and caco2 in vitro methods for evaluation of hypocholesterolemic properties of hydrophobically fractionated peptides from rice and soy. H. Zhang, C. Shoemaker, L. Cheng, W. H. Yokoyama
4:15 57. Metabolite profiling of maize grain: Differentiation due to genetics, environment, and input systems. K. Engel, R. M. Roehlig, T. Frank
4:40 58. Polyphenol content of seeds from amaranth. S. Steffensen, & Rinnan, A. Mortensen, B. Laursen, R. de Troiani, E. Noellemeyer, D. Janovská, K. Dusek, J. Délano-Frier, A. Taberner, C. Christophersen, I. Fomsgaard
5:05 Concluding Remarks

MONDAY AFTERNOON March 28 Section B Anaheim Marriott Orange County IV

Spencer Award Symposium

E. Hellmuth, D. Schooley, Organizers, Presiding

1:30 Introductory Remarks

1:35 59. Insect olfaction agonists and antagonists: Possibilities for behavioral control of insects. E. Plettner, H. Chen, Y. Yu, Y. Gong

2:00 60. Chemistry and applications of terpenoid pheromones of mealybugs. J. G. Millar, Y. Zou, J. S. McElfresh, J. Moreira

2:25 61. Impact of kairomones on moth pest management: Pear ester and the Codling Moth. D. M. Light

2:50 Intermission

3:05 62. From juvenile hormone mimics to analgesic and anti-inflammatory pharmaceuticals. B. D. Hammock

3:30 63. Metabolism of methoprene: Primary metabolites and natural products. D. A. Schooley, G. B. Quistad

3:55 64. Discovery and applications of (S)-methoprene and related commercially useful juvenile hormone analogs, and applications of some insect sex pheromones and kairomones for enhanced insect control with low environmental impact. C. A. Henrick

4:45 Concluding Remarks

MONDAY EVENING 8:00 - 10:00pm March 28

Sci-Mix Undergraduate Poster Session Agricultural and Food Chemistry

L. Jackson, Organizer Sponsored by CHED, Cosponsored by AGFD and SOCED

101, 102, 103, 105, 108, 117, 118, 120, 122, 123, 124, 134, 135, 136, 137, 138, 139, 140, 141, 143, 144, 146. See subsequent listings.

TUESDAY MORNING March 29 Section A Anaheim Marriot Orange County III

IYC Public Appreciation of Agricultural and Food Chemistry: Food Tastes Good!

N. Da Costa, Organizer, Presiding M. H. Tunick, Presiding A. Mitchell, D. Weerasinghe, M. Appell, Organizers

8:30 Introductory Remarks

8:35 65. Chemistry underlying the differences between cheese varieties. M. H. Tunick

9:00 66. Discovery of a new generation of highly potent bitterness blockers. I. M. Ungureanu, A. H. Yap, S. Machover, D. Bom, E. Kohlen, A. T. Daniher, P. A. Christenson, J. P. Slack, A. Odley, J. Augelli, E. van Ommeren, K. A. Bell, K. Gray, L. Ostopovici-Halip, C. G. Bologna, T. I. Oprea

9:25 67. Hyperspectral image analysis of mango fruits during storage. Y. Makino, A. Isami, Y. Kawagoe, S. Oshita, S. Kuroki, A. Y. Purwanto, U. Ahmad, M. S. Sutrisno, N. Yasukawa, R. Ishiyama, M. Tsukada, M. Serizawa

9:50 Intermission

10:05 68. Flavor chemistry of the "Bloody Mary" cocktail. N. C. Da Costa

10:30 69. Synthesis and characterization of sulfide modified vegetable oils. G.B. Bantchev, G. Biresaw, J.A. Kenar

10:55 Concluding Remarks

TUESDAY MORNING March 29 Section B Anaheim Marriott Orange County IV

Bioactives in Food and Natural Health Products: Fundamentals, Applications, and Health Effects

A. Mitchell, Organizer, Presiding M. Appell, Presiding

8:30 Introductory Remarks

8:35 70. Bioactive components of *Carica papaya* seed oil. I. S. Afolabi, V. O. Adade

9:00 71. Characterization of amaranth-like lunasin: A novel cancer-preventive peptide. E. Maldonado Cervantes, H. J. Jeong, M. F. León-Galván, A. Barrera-Pacheco, A. De León-Rodríguez, E. González de Mejía, B. O. de Lumen, A. P. Barba de la Rosa

9:25 72. Phytochemical composition and antioxidant capacity of low-linolenic soybeans. M. Whent, J. Hao, M. Slavin, L. Yu

9:50 73. Rapid determination of catechins in green tea. P. R. Perati, B. De Borba, J. S. Rohrer

10:15 Intermission

10:30 74. Systematic study of the polyphenol: Composition of extracts of *Hibiscus sabdariffa*. H. A. Sindi, M. Morgan, L. Lang

10:55 75. Determination of polymethoxyflavones and monodemethylated polymethoxyflavones in citrus fruits and their tyrosinase inhibition ability. C. Lo, Y. Lin, S. Li, M. Pan, C. Ho

11:20 76. Purification and characterization of α -L-rhamnosidase from *Aspergillus niger*. H. Ni, F. Chen, H. Cai

11:45 Concluding Remarks

TUESDAY MORNING March 29 Section C Anaheim Marriott Platinum IV

General Papers

J. Seiber, J. LEE, Presiding N. Da Costa, Organizer

8:30 Introductory Remarks

8:35 77. Investigation of antioxidant properties of a local spice (*Monodora myristica*) extract. M. Azih

8:50 78. Novel inhibitory mechanism of dopachrome formation by thymol. H. Satooka, I. Kubo

- 9:15 79. Rapid determination of anthocyanins in pomegranate juice. P. R. Perati, B. DeBorba, J. S. Rohrer
- 9:35 80. Effect of common salt and red pepper (*Capsicum annum*) on fatty acid stability in melon (*Citrullus vulgaris* schrad) seed meal oil. H. O. Iyawe, M. C. Azih
- 9:55 Intermission
- 10:10 81. Screening and mapping of some constituents in potatoes using infrared and Raman spectrometers. N. Phambu
- 10:30 82. Accelerated extraction of phenolic components from reduced volume barrels by whiskey spirits. J. D. Jeffery, K. A. Berglund
- 10:50 83. GC-MS determination of bisphenol A analogs in shrimp and lobster samples. Y. Zuo, Z. Zhu, Z. Luo, Y. Deng, J. D. Stuart
- 11:10 84. Can acrylamide be mitigated throughout the industrial production process of French fries? R. Medeiros Vinci, F. Mestdagh, C. Van Poucke, C. Van Peteghem, B. De Meulenaer
- 11:30 Concluding Remarks

TUESDAY AFTERNOON March 29 Section A Anaheim Marriott Orange County III

IYC Contribution of Women to Agricultural and Food Chemistry

- A. Mitchell, A. Rimando, V. Acquarone, Organizers, Presiding S. Risch, S. Ebeler, Organizers
- 1:30 Introductory Remarks
- 1:35 85. Food scientists: A call to action. D. G. Bradley
- 2:00 86. Past, present, and future: Contributions of women to the agricultural sciences. C. Woteki
- 2:25 87. Innovative food processing for health. T. McHugh
- 2:50 88. Perspectives on flavor research. A. C. Noble
- 3:15 Intermission
- 3:30 89. Environmental stress, wild berry fruits, and human health benefits. M. Lila
- 3:55 90. Development of new rice cultivars for conventional and value-added markets. A. McClung, R. Fjellstrom, W. D. Park, C. Bergman, S. McCouch
- 4:20 91. Biofortification in Brazil: A sustainable way to improve nutrition and health. M. R. Nutti
- 4:45 92. From Montreal to Zurich, Ottawa and finally to California almonds. K. Lapsley
- 5:10 Concluding Remarks

TUESDAY AFTERNOON March 29 Section B Anaheim Marriott Orange County IV

AGFD International Year of Chemistry (IYC) Symposium

- M. Appell, N. Da Costa, Organizers, Presiding A. Mitchell, D. Weerasinghe, Organizers
- 1:30 Introductory Remarks
- 1:35 93. Integrated rate expression for carbon dioxide assimilation in green plants. S. N. Datta, A. Panda
- 1:55 94. SYP-11277: A novel strobilurin containing phenylaminopyrimidine acaricide. B. Chai, C. Liu, H. Li, S. Liu, Y. Song, J. Chang
- 2:15 95. Microwave-induced esterification of chlorogenic acid and other polyphenolic acids catalyzed by Hafnium (IV) chloride. B. Dayal, V. Yannamreddy, I. Racharla, M. Lea, J. Desai
- 2:35 96. Design, synthesis and structure-activity relationship of novel dichloro-allyloxy-phenol derivatives containing substituted pyrazoles. M. Li, C. Liu, J. Zhang, Q. Wu, Y. Song
- 2:55 Intermission
- 3:10 97. Inhibitory effect of magnolol on TPA-induced skin inflammation and tumor promotion in mice. M. Pan

- 3:30 98. Mild oxidation promotes myofibrillar protein gelation and meat hydration: The mode of action. Y. L. Xiong
- 3:50 99. Novel substituted diphenylamine fungicide. H. Li, C. Liu, G. Huang, Z. Li, M. Zhu
- 4:10 Concluding Remarks

TUESDAY AFTERNOON 2:00-4:00pm March 29 Section C Anaheim Marriott Platinum IV

General Posters

A. Mitchell, L. Jackson, N. Da Costa, Organizers

100. Highly sensitive quantification of unconjugated metabolites of trenbolone acetate in bovine serum by liquid chromatography-tandem mass spectrometry. Q. Cai, H. Guan, G. P. Cobb
101. Effect of washing treatments and sonication on pesticides in tomatoes. F. Al-Taher, Y. Chen, J. Cappozzo
102. Comparative metabolic pathways of [14C]-chlorantraniliprole in the ruminant goat and monogastric rat and hen. V. Gaddamidi, S. R. Swain
103. Determination of benzo[a]pyrene in palm-derived tocotrienols. S. Ong
104. Lactic acid bacteria as a biomarker to detect rodenticides in milk. M. H. Hathurusinghe, S. A. Ibrahim, R. Gyawali, M. Tajkarimi
105. Impact of rodenticides on the coagulation properties of milk. N. T. Georgette, T. Tse, S. A. Ibrahim
106. Effect of sanitizer solutions on the stability of ricin dried on a stainless steel surface in the absence and presence of food matrices. L. S. Jackson, K. Banaszewski, C. Chang, W. Tolleson
107. NBO analysis and vibrational frequencies of citrinin: A density functional study. M. Appell, D. Moravec, W. B. Bosma
108. Detection of high fructose corn syrup adulteration in single-source honey samples via SNIF-NMR. A. D. Marchetti, M. Lever
109. Antimicrobial activity of lactic acid, acetic acid, and copper on growth of *Cronobacter* spp. (*Enterobacter sakazakii*) in laboratory medium and fluid food products. M. Tajkarimi, R. Gyawali, S. A. Ibrahim, S. A. Hayek, L. L. Williams
110. Chemosensor arrays for the identification of heat-denatured protein. C. Hou, J. Dong, G. Zhang, Y. Zhang, D. Huo
111. Effects of processing conditions on availability of nutraceuticals in whole wheat bread with cold-pressed grape seed flour and oil. L. Binzer, R. Brinsko, J. Cha, S. Chen, S. Green, K. Grob, J. Hao, C. Hitz, L. Li, S. Swamy, M. Y. Wolf, M. Xu, M. Yanik, M. Slavin, L. Yu
112. Substituting applesauce for fat (butter) in chocolate chips cookie. S. Hayek, S. A. Ibrahim, H. J. Khouryieh
113. Thermal properties of encapsulated polyunsaturated fatty acid esters. R. A. Holser
114. Oxidative cross-linking of sugar beet pectin and β -lactoglobulin and improved functional properties. L. Wicker, J. Jung
115. Identification and quantitation of six phenolic amides from *Amaranthus*. H. A. Pedersen, S. K. Steffensen, C. Christophersen, A. G. Mortensen, L. N. Jørgensen, S. Niveyro, R. M. de Troiani, R. J. Rodríguez-Enríquez, A. Barba-de la Rosa, I. S. Fomsgaard
116. "Green" purification of radish (*Raphanus sativus* L.) anthocyanin-rich extracts using chitosan. P. Jing
117. Antioxidant activity of selected new world wines. B. Ringley, S. Schreiner
118. Antioxidant activity of red and white wine in inhibiting cholesterol oxidation. L. Tian, m. z. Xu, H. Wang
119. Investigation on gamma-aminobutyric acid as an inhibitor of formation of advanced lipoxidation end-products: Its interaction with malondialdehyde. Y. Deng, L. Xu, X. Li, N. He, B. Liu

120. Anti-carcinogenic and anti-inflammatory properties of nobiletin and 3',4'-didemethylnobiletin. G. S. Chang
121. Lycopene effects in tissue culture cells. T. Golden, B. Jones, A. Tabor, M. Cloyde, R. Ritchie, A. Davis, P. Perkins-Veazie
122. Bioassay directed fractionation and anti-microbial activity of *Lippia sidoides*. A. J. Gowell, A. Chandra, K. Malik
123. Anticancer and antioxidant activities of fatty ester derivatives of carnosic acid. A. Prasad, C. Hall III
124. Antioxidant effects of polyphenols from *Artemisia tridentata* ssp. *tridentata* in HepG2 cells. E. / Kobic
125. Micro-oxygen processing and detection of biochemical deteriorative vectors in bananas. S. E. Perez Almeida, J. H. Mulligan, A. L. Brody, L. Wicker
126. Flavanones with neuraminidase inhibitory activity from the roots of *Amorpha fruticosa* L. Y. Kim, H. Yuk, Y. Ryu, W. Lee, K. Park
127. Polyphenols of soybean leaves, displays potent α -glucosidase inhibitory activity. H. Yuk, Y. Kim, J. Cho, T. Jeong, K. Park
128. Extraction and characterization of sorghum polymeric proteins by size exclusion chromatography. B. Ioerger, S. Bean
129. RP-HPLC analysis of sorghum protein digestibility. D. L. Blackwell, S. R. Bean
130. Analysis of phytochemicals in a traditional herbal remedy for BPH. N. L. Paiva, A. Baughman, S. T. Jones, K. F. Faull, A. Villamil
131. Isolation and identification of potential bioactive compounds from "Maguey" roots infusion and crude extracts. N. J. Rodriguez, E. Reyes
132. Isolation and identification of potentially bioactive compounds from *Momordica charantia* L. "Cundeamor". M. J. Aviles, J. Torres, S. Rosado, E. D. Reyes
133. Determination of eleutherosides in dietary supplements containing Siberian ginseng by HPLC. A. J. Gowell, K. Persons, A. Chandra
134. Enhancement of α - and β -galactosidase activity in *Lactobacillus reuteri* by metal ions. S. A. Hayek, D. Song, S. A. Ibrahim, M. Tajkarimi, A. Alazzeah
135. Purification and characterization of a papaya (*Carica papaya* L.) pectin ethylesterase isolated from "Liquipanol". P. Vasu, B. J. Savary, R. G. Cameron
136. Separation and identification of polyphenolic compounds from *Artemisia tridentata* ssp. *tridentata* using high-performance liquid chromatography coupled with diode array detection. J. M. Patton, C. Dadabay
137. Effect of microwave extraction on phenolic content of beans. A. Biswas
138. Characterization of anthocyanin profile and quantification of antioxidant activity in purple sweet potatoes prepared by different cooking methods. D. Nguyen, J. M. Chapman
139. Characterization of tannin-metal complexes by UV-Visible spectrophotometry. R. Liu, S. R. Tindall, J. M. Gonzalez, J. J. Halvorson, A. E. Hagerman
140. Metal resistance and uptake capacity of edible mushroom: *Hypsizygus ulmarius*. R. B. Dandamudi, G. Coimbatore, M. Pandey, N. G. Rao
141. Analysis of differential proteins in amaranth roots under water stress. J. A. Huerta-Ocampo, M.F.León-Galván, L.B.Ortega-Cruz, A.Barrera-Pacheco, A.De León-Rodríguez, G.Mendoza-Hernández, A.P.Barba de la Rosa
142. Cloning of a novel Zn-Fg transcription factor involved in abiotic stress in amaranth leaves. H. S. Aguilar-Hernández, M. F. León-Galván, L. Santos, A. De León-Rodríguez, A. Barrera-Pacheco, E. Espitia-Rangel, R. G. Guevara-González, A. P. Barba de la Rosa
143. Engineering and metabolic regulation of vitamin C biosynthesis in plants. L. Zhang, K. Tang, W. Chen

144. Application of Shiitake mushroom extract to enhance the growth of lactic acid bacteria and bifidobacteria . O. Hassan, D. Song, S. A. Hayek, S. A. Ibrahim, O. S. Isikhuemhen, A. Shahbazi, A. Abughazaleha
145. Synthesis of lycorine analogs and activity against *Flavobacterium columnare*. C. Tan, K. K. Schrader, C. S. Mizuno, A. M. Rimando
146. Influence of technological processing on the quality attributes and storage stability of small pelagic fish. H. A. Abogharbia, A. A. Abdelnaby, E. M. Abotor
147. Application of proteomics to understand meat attribute traits in slow and fast growing chickens. P. Phongpangan, S. E. Aggrey, A. Grider, L. Wicker, J. Mulligan
148. Effect of enzymatic randomization on positional distribution and stability of menhaden oil and seal blubber oil. J. Wang, F. Shahidi
149. Improvement of the oral bioavailability of curcumin using polymer micelle- and lipid-based delivery systems. H. Yu, Q. Huang
150. High-solids biphasic H₂O-CO₂ pretreatment using single and dual temperature stages. J. S. Luterbacher, J. W. Tester, L. P. Walker
151. Effect of fertilizer application and irrigation on agronomic characters of *Andrographis paniculata* (Burm.f.) Wall. ex Nees var. *paniculata* . S. Sugathadasa, R. Samarasekera, G. Pushpakumara

WEDNESDAY MORNING March 30 Section A Anaheim Marriott Orange County III

Bioactives in Natural Sweeteners

N. P. Seeram, Organizer, Presiding

8:30 Introductory Remarks

8:35 152. Antioxidant polyphenols from maple syrup. M. M. Abou-Zaid

9:00 153. Opening new doors: Agave syrup. M. G. López, A. M. Vera-Guzmán, E. Mellado-Mojica

9:25 154. Chromatographic analysis of natural sweeteners: UPLC applications for the analysis of food and beverage products. C. Hudalla, P. Iraneta, P. Smith, D. Walsh, K. Wyndham

9:50 Intermission

10:05 155. Maple sap and syrup are a rich sources of abscisic acid and polyphenols with potential benefits to health. Y. Desjardins

10:30 156. Commercial sweeteners: Comparison of their effect on cellular antioxidant capacity and glucose uptake. J. Vinson, M. McHale

10:55 157. Further insights into the phenolic constituents present in maple syrup. L. Li, N. P. Seeram

11:20 158. HPLC determination of steviol glycosides in stevia sweeteners: An alternative to UV detection. D. C. Hurum, B. M. De Borba, D. Mohindra, J. S. Rohrer

11:45 Concluding Remarks

WEDNESDAY MORNING March 30 Section B Anaheim Marriott Orange County IV

Vitamins: Effectiveness of Supplements vs. Food

G. Lester, Organizer, Presiding M. Appell, Organizer

8:30 Introductory Remarks

8:35 159. Evaluating sweet potato as an intervention food for preventing vitamin A deficiency. B.J. Burri, T. Turner

9:05 160. Carotene and novel apocarotenoid concentrations in orange-fleshed *Cucumis melo* melons: Determinations of beta-carotene bioaccessibility and bioavailability. M. K. Fleshman, G. E. Lester, K. M. Riedl, S. J. Schwartz, E. H. Harrison

9:35 161. Does vitamin D associate with Autism Spectrum Disorder? Y. Lin, P. Aronov, J. Yang, J. Van de Water, P. Ashwood, B. Hammock
10:05 Intermission
10:25 162. Factors affecting apparent bioavailability of carotenoids and anthocyanins. B. A. Clevidence, J. A. Novotny, D. J. Baer, S. J. Britz, C. S. Charron
10:55 163. Bioavailability and efficacy of vitamins and provitamins in foods. M. Failla
11:25 164. Food processing and matrix affects bioavailability of carotenoids and folates. S. J. Schwartz
11:55 Concluding Remarks

WEDNESDAY MORNING March 30 Section C Anaheim Marriott Platinum IV

Bioactives in Food and Natural Health Products: Fundamentals, Applications, and Health Effects

A. Mitchell, Organizer, Presiding

8:30 Introductory Remarks

8:35 165. Nutritional and biological properties of extra virgin olive oil. E. Frankel

9:00 166. Quantification of the binding of curcumin to casein micelles in heated and unheated milk. S. Rahimi Yazdi, M. Corredig

9:25 167. Controlling kinetics of phase separation in milk containing nutritionally significant beta- glucan concentrations. N. Sharafbafi, M. Alexander, S. Tosh, M. Corredig

9:50 168. Interactions of milk proteins with tea polyphenols. S. Haratifar, G. Paliyath, M. Corredig

10:15 Intermission

10:30 169. Characterization of antihypertensive peptides presents in amaranth seed storage proteins. A. P. Barba de la Rosa, A. Barba Montoya, P. Martínez-Cuevas, B. Hernández-Ledesma, M. F. León-Galván, A. De León-Rodríguez, C. González

10:55 170. Release of bioactive peptides from flaxseed (*Linum usitatissimum* L.) protein under static and dynamic simulated gastrointestinal digestion. H. K. Marambe, P. J. Shand, J. P. Wanasundara

11:20 171. Fatty acids, tocopherols and polyphenolic compositions and antioxidant activities of heartnut (*Juglans ailanthifolia* var. *cordiformis*). R. Tsao, L. Li, H. Li, T. Wu, J. K. Kramer

11:45 172. Colored avocado seed extract with radical scavenging and anti-carcinogenic activity . D. Dabas, G. R. Ziegler, R. J. Elias, J. D. Lambert

12:10 Concluding Remarks

WEDNESDAY AFTERNOON March 30 Section A Anaheim Marriott Orange County III

Bioactives in Natural Sweeteners

N. P. Seeram, Organizer, Presiding

1:30 Introductory Remarks

1:35 173. Evaluation of phenolic-enriched maple syrup extracts for inhibition of carbohydrate hydrolyzing enzymes relevant to type-2 diabetes management. E. Apostolidis, L. Li, C. Lee, N. P. Seeram

2:00 174. Rheology of Agave syrup. A. M. Vera-Guzmán, L. V. Aquino-Gonzalez, M. G. López

2:25 175. Availability of polyphenols in maple syrup subjected to in vitro gastrointestinal digestion and their antiproliferative effects on human colon cancer cell lines. A. Gonzales-Sarrias, L. Li, P. Nahar, N. P. Seeram

2:50 Intermission

- 3:05 176. Impact of symbiotic maple saps on the ecological balance of mice microflora. R. Hammami, I. Fliss
- 3:30 177. Evaluation of anti-inflammatory effects of a maple syrup polyphenol-enriched extract in LPS-stimulated murine macrophages. P. P. Nahar, M. V. Driscoll, L. Li, A. Gonzales-Sarrias, A. Slitt, N. P. Seeram
- 3:55 178. Analyzing the physiological functionalities of maple syrup from Canada. K. Abe, Y. Watanabe, A. Kamei, Y. Nakai
- 4:20 179. Phenolic content and antioxidation capacity of hot-water extracts of sugar maple. M. J. Goundalkar, B. Bujanovic, L. Li, N. P. Seeram
- 4:45 Concluding Remarks

WEDNESDAY AFTERNOON March 30 Section B Anaheim Marriott Orange County IV

Vitamins: Effectiveness of Supplements vs. Food

M. Appell, G. Lester, Organizers, Presiding

1:30 Introductory Remarks

1:35 180. Weather, climate, and phytonutrients. S. Britz

2:05 181. Mechanisms and variability of intestinal absorption of beta-carotene in humans: Relationships to cholesterol absorption. M. K. Fleshman, K. A. Cope, J. A. Novotny, D. J. Baer, P. J. Jones, K. M. Riedl, S. J. Schwartz, E. H. Harrison

2:35 182. USDA databases for dietary components in food and dietary supplements. J. M. Holden, J. M. Roseland, S. E. Gebhardt, K. W. Andrews, J. T. Dwyer

3:05 Intermission

3:20 183. Vitamin and mineral content in diced tomatoes processed using aseptic, hot fill and conventional canning. D. M. Barrett

3:50 184. Comparing food-based interventions and supplements for preventing vitamin A deficiency. B. J. Burri

4:20 Panel Discussion

THURSDAY MORNING March 31 Section A Anaheim Marriott Orange County III

General Papers

N. Da Costa, Organizer, Presiding A. Mitchell, Organizer

8:30 Introductory Remarks

8:35 185. Insecticide susceptibility levels among Asian citrus psyllid populations in Florida and evaluating the efficacy of selected insecticides against *Candidatus Liberibacter asiaticus* infected psyllid. S. Tiwari, M. E. Rogers, L. L. Stelinski

8:55 186. Presence of multiple kavalactone-yielding precursors in Kava roots. T. N. Voro, M. Naiker, S. Prasad

9:15 187. Persistent halogenated compounds in aquaculture environments of South China: Implications for health risk to global consumers via fish consumption. H. Yu, Y. Guo, B. Zhang, E. Y. Zeng

9:35 188. Sorption of polyphenolics (tannins) to natural soils. M. A. Schmidt, A. E. Hagerman, J. Gonzalez, J. J. Halvorson

9:55 Intermission

10:10 189. Cellulose solvent-based biomass pretreatment: Concentrated phosphoric acid vs. ionic liquid. n. sathitsuksanoh, Z. Zhu, Y. Zhang

10:30 190. Calcium-dependent characteristics of a subtilisin-like halotolerant proteinase of *Virgibacillus* sp. SK37. E. Phrommao, M. Yamabhai, S. Rodtong, J. L. Steele, J. Yongsawatdigul

- 10:50 191. Occurrence and formation of benzene in foodstuffs. R. Medeiros Vinci, J. Van Loco, L. Jacxsens, T. de Schaetzen, M. Canfyn, I. Van Overmeire, B. De Meulenaer
11:10 192. Differences in detailed chemistries among moist snuff, snus, and novel smokeless tobacco products. J. H. Lauterbach, D. A. Grimm
11:30 193. Evaluation of the antifungal activities of twenty three spices against plant pathogens. M. M. Radwan, N. Tabanca, D. E. Wedge, S. J. Cutler
11:50 Concluding Remarks

THURSDAY MORNING March 31 Section B Anaheim Marriott Orange County IV

Effect of Agricultural Practices and Growth Conditions on Bioactive Compounds

A. Rimando, L. Yu, Organizers, Presiding

8:30 Introductory Remarks

8:35 194. Environmental regulation of human bioactive vitamins (ascorbic acid, folate, and carotenoids) in fruits and vegetables. G. E. Lester

9:00 195. Effect of preharvesting and postharvesting factors on phytochemical content and antioxidant activity of almonds and pistachios. O. Chen

9:25 196. Effect of cultivar on the phenolic composition and antioxidant properties of basil (*Ocimum basilicum* L.). E. M. Kwee, E. D. Niemeyer

9:50 197. Effect of organic and inorganic fertilizers and pesticides on the content of antioxidants in brown rice. A. P. Tuaño, Z. Xu, M. B. Castillo, C. P. Mamaril, R. V. Manaois, M. V. Romero, B. O. Juliano

10:15 Intermission

10:30 198. Acclimatization of *Smallanthus sonchifolius* for oligofractans production in Mississippi. R. Moraes, F. Dayan, Y. Wang, J. Sumyanto, G. Swain, A. Cerdeira, I. Khan

10:55 199. Metabolomic evaluation of the effects of growth conditions and harvest time on bioactivity in Chinese medicinal plants. W. Chang, R. Hsieh, C. Chu, M. Lin, M. Lee, W. Peng

11:20 200. Effects of myrosinase inactivation on glucosinolates and anthocyanins from red radish (*Raphanus sativus* L.) root. P. Jing

11:45 201. Exploring Sri Lankan medicinal plants: A rich source of bioactive phytochemicals. R. R. Samarasekera, P. H. Kirihettilyanage, A. - . Ata

12:10 202. Ultra-performance liquid chromatographic separation of geometric isomers of carotenoids, polyphenols and antioxidant activities of 20 tomato cultivars and breeding lines. H. Li, R. Tsao, R. Liu, S. Loewen

12:35 Concluding Remarks

THURSDAY MORNING March 31 Section C Anaheim Marriott Grand Ballroom H

Utilization of Waste and Co-Product Materials

V. Finkenstadt, Organizer, Presiding F. Shahidi, A. Mitchell, Organizers

8:30 Introductory Remarks

8:35 203. Carbohydrate composition analysis in processed tomato serum. B. Wu, B. L. Reuhs

9:00 204. Comparison of acrylate monomers for preparing thermoplastic feathers with water resistance through graft polymerization. E. Jin, N. Reddy, Z. Zhu, Y. Yang

9:25 205. Biorefinery blueprint: A growth-arrested biotechnological process for manufacturing a portfolio of commodity and fine chemicals. A. A. Vertes, M. Inui, H. Yukawa

9:50 Intermission

10:05 206. Utilization of waste tea leaves to suppress the odors in compost processes. C. Lin, Y. Yuan, M. Wu, C. Lin, M. Huang

10:30 207. Sensitive determination of hydroxymethyl furfural in honey and biomass. L. Basumallick, D. C. Hurum, J. S. Rohrer
10:55 208. Structure-function properties of anticorrosive exopolysaccharides. V. L. Finkenstadt, C. B. Bucur, G. L. Cote, K. O. Evans
11:20 Concluding Remarks

AGFD Abstracts, 241st ACS Nat'l Meeting, Anaheim, Mar. 27-31, 2011

AGFD 1 Antiproliferative and DNA scission inhibitory activities of decorticated millets Anoma Chandrasekara, k76gapc@mun.ca, Memorial Univ., St Johns NL, Canada ; Fereidoon Shahidi Millets are decorticated before consumption and hulls could serve as a potential source of natural antioxidants. Antioxidant activities of phenolic extracts of kodo and pearl millet whole grains, decorticated grains, and hulls were examined by monitoring inhibition of radical-induced DNA scission, human low density lipoprotein (LDL) cholesterol and liposome oxidation. Total phenolic content (TPC), hydroxyl and peroxy radical inhibition and antiproliferative activities against HT-29 cells were measured. Phenolic compounds were identified and quantified using HPLC. All phenolic extracts exhibited inhibition against LDL and liposome oxidation and DNA scission. Hulls of millets showed three times higher TPC than that of whole grain. At the end of day 4 kodo millet extracts inhibited cell proliferation in the range of 75-100%. Several phenolic acids were identified and contributed for the observed effects. Thus, millet grains and hulls may serve as potential sources of nutraceutical and functional food ingredients in health promotion.

AGFD 2 Structure and function of milk glycolipids Hyeoung Lee, hynlee@ucdavis.edu, Davis CA; Carlito B. Lebrilla; J. Bruce German Dept. of Food Sci & Tech., Univ. of Calif. Davis, Davis CA Dept. of Chemistry, Univ. of Calif. Davis Nestle Res. Ctr., Davis CA Milk glycosphingolipids (GSLs), components of milk fat globule membranes, participate in diverse biological processes, including pathogen binding and immune responses. The biological roles of GSLs are dependent on their two basic components: the ceramide and oligosaccharide portions. GSLs are often found with high structural heterogeneity arising from the variation in length of the ceramide tails and the saccharide moieties. A combination of factors, including the individual variation of the ceramide, the isomers for the oligosaccharides, and the possible configurations of the ceramide and oligosaccharides, add an additional level of complexity. Here a method for addressing GSL heterogeneity has been developed using microfluidic chip based nanoLC MS. Separation of the GSLs was achieved with high sensitivity and mass accuracy. The use of this technique provides not only the oligosaccharide but also the ceramide structures, which will provide the necessary chemical basis for insights into the physiological roles and effects of GSLs.

AGFD 3 Validity of Brix for predicting flavor composition of Concord grape juice Meera M. Iyer, mmi8@cornell.edu, Food Science, Geneva NY; Gavin L. Sacks; Olga I. Padilla-Zakour Food Science, Cornell Univ., Geneva NY Soluble solids (Brix) are widely used for evaluating Concord grape maturity; however, the utility of this parameter for predicting key properties (e.g. aroma, color) of grapes across multiple viticultural sites is poorly characterized. Grapes were harvested from nine sites across three climactic zones in New York and Pennsylvania at three maturity points (13-16 Brix) for each site and processed into juice via standard industry procedures. Key aroma compounds were quantified by gas chromatography - mass spectrometry. Significant differences ($p < 0.01$) were observed between and within sites for trans-2-hexenal, trans-2-hexenol, and methyl anthranilate, with order of magnitude differences observed at similar Brix; 13.6 Brix juice from two different zones exhibited a 30-fold difference in methyl anthranilate levels (161 ± 7 ppb vs. 4.8 ± 0.5 ppm). Beta-damascenone, a thermally generated compound, was not significantly different among all samples ($p = 0.17$). This underscores the need for new metrics for evaluating Concord grape quality beyond Brix.

AGFD 4 Comparing apples and onions: Distinct bioavailability of quercetin glycosides from different foods and mixture Jihyun Lee, jihlee@ucdavis.edu.; Dirk M Holstege C Patrick Dunne; Alyson E Mitchell Dept. of Food Sci & Tech., Univ. of California, Davis, Dept. of Environmental Toxicology, Univ. of California, Davis, DoD Combat Feeding Directorate, Natick Soldier Research, Dev. & Engineering Center, Natick MA Quercetin has anti-inflammatory properties and appears to promote vascular health in synergy with other flavonoids. Apples and onions are rich source of quercetin glycosides; however, the dominant types of glycosides vary between species and cultivars. Therefore, the glycoside composition of a composite standard of dried apple peel and dried onion powder were characterized and incorporated into either an apple peel-enriched applesauce (AES), onion powder-enriched applesauce (OES) or applesauce enriched with both apple peel and onion powder (MES). The sauces delivered 70 mg (AES), 99 mg (OES), and 84 mg (MES) quercetin aglycone equivalents. The predominant forms of quercetin in the apple peel were quercetin 3-O-galactoside, 3-O-glucoside, and 3-O-rhamnoside and in the onion 3,4'-O-glucoside and 4'-O-glucoside. The pharmacokinetics of quercetin (total of all species) absorption (C_{max} , t_{max} and AUC_{0-24} h) and elimination half-time ($t_{1/2}$) in 16 healthy volunteers were evaluated. Consumption of the OES led to a $C_{max} = 255.5 \pm 90.1$ ng/mL, $t_{max} = 1.7 \pm 1.3$ h and $t_{1/2} = 14.3 \pm 4.5$ h, whereas the AES led to a $C_{max} = 58.5 \pm 20.4$ ng/mL, $t_{max} = 2.9 \pm 2.0$ h and $t_{1/2} = 61.9 \pm 76.0$ h. The MES resulted in an intermediate response with a $C_{max} = 126.6 \pm 40.6$ ng/mL, $t_{max} = 2.5 \pm 1.4$ h and $t_{1/2} = 18.0 \pm 6.3$ h.

AGFD 5 Luminescence from extrinsic and intrinsic probes in solid state amorphous human serum albumin demonstrates solvent-protein slaving Andrew R. Draganski, dragansk@eden.rutgers.edu, Dept. of Food Science, Rutgers Univ., New Brunswick NJ, The physical properties of amorphous biomolecules are important to the stability of low-moisture foods and pharmaceuticals. Lyophilized proteins are stabilized via inclusion of excipients. The effect on protein dynamics of substitution of surface water with sugars is unclear. To explore this question, luminescence studies have been conducted on human serum albumin (HSA) in the

solid state using extrinsic probes and intrinsic tryptophan. Phosphorescence is an ideal approach, as the long-lived triplet state of molecular probes is sensitive to the long time-scale motions of dry proteins. HSA binds luminescence probes that report on the protein's surface; it contains a single, buried tryptophan that reports on the interior of the protein. Amorphous protein-sugar films were prepared by spreading concentrated solutions of sugar + HSA with bound probe onto quartz slides, followed by drying and desiccation. Intensity decays were fit with multi-exponential functions; rates of non-radiative decay (k_{NR}) were calculated from the average lifetime.

AGFD 6 Formation of stable O/W emulsions and cold-set films by pH-shifting-treated soy proteins is attributed to the dissociation and unfolding of β -conglycinin and glycinin Jiang Jiang, jiangjiang0909@gmail.com, Univ. of Kentucky, Lexington KY; Youling Xiong Dept. of food science, Jiangnan Univ., Wuxi Jiangsu China Dept. of Animal and Food Science, Univ. of Kentucky, Lexington The pH-shifting process, i.e., unfolding at extreme pH conditions followed by refolding at pH 7, has been used to produce molten globule polypeptides with improved functionality. In the present study, soy protein isolate (SPI) and its components β -conglycinin (7S) and glycinin (11S) were subjected to acid (pH 1.5–3.5) or alkali (pH 10–12) treatments. Preliminary results showed that pH-shifting could induce substantial increases in protein surface hydrophobicity and complete dissociation of SPI subunits without significant disruption of the secondary structure. These physicochemical changes led to pronounced enhancements in emulsifying activity and solubility. The pH-shifting, notably at pH 12.0, produced soluble, disulfide-linked polymers from 11S which seemed to contribute to emulsion droplet stability. Alkaline pH-shifting treated SPI also spontaneously formed elastic films without heating and had a reduced antagonism with myofibrillar proteins in a composite meat gel system when compared with native SPI.

AGFD 7 Nano-encapsulation of polyphenols by milk caseins Sanaz Haratifar, sharatif@uoguelph.ca, Gopinadhan Paliyath; Kelly Meckling; Milena Corredig Food Science, Univ. of Guelph, Canada Dept. of Plant Agriculture, Univ. of Guelph, Canada Human Health & Nutritional Sciences Facilities, Univ. of Guelph, Canada In spite of the widespread recognition of the bioactivity of polyphenols, their bioefficacy is still a source of debate. The bioavailability of polyphenols is a key factor that determines their biological functions in vivo. EGCG, a green tea-derived polyphenol, has been shown to suppress cancer cell proliferation. When tea is mixed with milk, tea catechins are incorporated into the casein micelles. Casein nanoparticles can load a substantial amount of catechins within their supramolecular structure but the biological significance of this nano-encapsulation is not fully understood. In this study, the biological efficacy of the catechin-milk protein complexes was tested using HT-29 colon cancer cells. The results showed that these complexes still caused a decrease in the proliferation of HT-29 cells, although to a different extent than catechins in isolation. The role played by the serum components of milk and the whey proteins in the bioefficacy of catechins against HT29 proliferation is also different.

AGFD 8 Effective antifungals in the form of nanoencapsulated itraconazole (ITZ) Cristina M Sabliov, csabliov@lsu.edu, Baton Rouge LA; Nipur Patel; Kenneth Damann Biol. & Agric. Eng., Louisiana State Univ. Baton Rouge The main benefit of using nanoparticles for the delivery of antifungals is to control the release of the antifungal drug near the cell surface or in the cytosol as a result of direct cellular uptake of nanoparticles. The antifungal ITZ functions by inhibiting the cytochrome P450-dependent 14- α -sterol demethylase synthesis of ergosterol, a vital component of fungal cell walls. Therefore, ITZ needs to be effectively internalized to stop ergosterol synthesis by the cell. Poly (lactic-co-glycolic) acid nanoparticles with entrapped ITZ were synthesized and their antifungal efficacy was tested in cell culture. The effectiveness of entrapped ITZ as a fungicide against *Aspergillus flavus* was improved by 100 fold as compared to that of the free drug suspended in water. The methodology developed in this project can be applied to develop antibacterial nanoparticles with entrapped natural and synthetic antimicrobials, potent against food borne bacteria, of interest to the food industry.

AGFD 9 Molecular gels-based controlled release devices for pheromones Swapnil R Jadhav, sjadhav@gc.cuny.edu, Bor-Sen Chiou; Delilah F Wood; Gloria DeGrande-Hoffman; Gregory M Glenn; George John Dept. of Chemistry, The City College of The City Univ. of New York, Western Regional Res. Ctr., USDA, Albany California Sustained and uniform release of pheromones is essential for superior pest control. Herein, immobilization of liquid pheromones through nanoscale self-assembly of biobased gelators is demonstrated as a green alternative method to develop efficient controlled release devices (CRDs). Enzymatically derived mannitol dioctanoate (a sugar-fatty acid conjugate) immobilized pheromones, 2-heptanone & lauryl acetate, at low concentration (<8 %wt/wt) without exhibiting any syneresis; thereby ensuring high loading capacity and leak-free performance. The gel-based CRD typically consisted of a fruit film, sugar gelator and pheromone. The use of biobased gelators ensures higher biocompatibility and biodegradability of CRDs and eliminates the cost associated with recovering spent devices. The self-assembly mechanism was deciphered by using microscopy, diffraction and rheological measurements, from which nano-width ribbons were observed to be responsible for gelation. The loading capacity of the gel-based device (~92 %wt/wt) was found to be approximately two folds greater than the standard CRD.

AGFD 10 Starch nanoencapsulation for aqueous dissolution of hydrophobic ingredients Seung-Taik Lim, limst@korea.ac.kr, 5-1 Anam-dong, Seoul Seoul, Republic of Korea ; Jong-Yea Kim; Eun-Ah Kim; Tae-Rang Seo Korea Univ, Republic of Korea Many nutrients and bioactive ingredients are hydrophobic and thus not readily applicable in aqueous foods and less bioavailable to human. To overcome these difficulties, both emulsification and encapsulation techniques are often used. Starch which is a common food carbohydrate can be used as an encapsulating agent for the hydrophobic ingredients through complex formation. The linear segments of starch, mainly amylose chains, tend to self-assemble into single helices by hosting the hydrophobic compounds. The complex formation enhances the water solubility and stability of the encapsulated compounds. The complexes could be obtained in the form of nanocrystals which homogeneously remain with good stability in aqueous media as colloidal dispersions. It is also expected that the starch chains are readily digested so that the hydrophobic compounds could be released and absorbed in the digestive tract. The physical property and size of the nanoparticles may be controlled by using dextrans of different sizes. Unlike cyclodextrins, starch and its dextrans have structural flexibility to accommodate the guest components of various sizes. The process for complex formation, however, requires a kinetic control and/or additional physical treatments such as ultrasonication and homogenization to obtain nano-sized particles. In this study, CoQ10 and beta-carotene were used for the nanoencapsulation.

AGFD 11 Limonene partitioning and release from nanostructured matrices measured using SPME Stephanie R Dungan, srdungan@ucdavis.edu, Dept. of Chemical Engineering and Materials Science, Davis California; Nathan W Lloyd; Susan E Ebeler Dept. of Food Sci & Tech., Univ. of California, Davis, Dept. of Chemical Engineering and Materials Science, Univ. of California, Davis, Dept. of Viticulture and Enology, Univ. of California, Davis The influence of microemulsions and micelles on the distribution and release of hydrophobic aromas within an aqueous material was investigated using solid phase microextraction (SPME). Headspace-SPME measurements above an aqueous solution of various total [limonene] or [surfactant] allowed us to probe the aroma distribution in three different regimes: a dilute regime, where the limonene concentration is small relative to the capacity of the micelle and displays ideal partitioning behavior; a concentrated regime, where the partition coefficient changes with the molar ratio of aroma molecule to surfactant; and a saturated regime. Non-equilibrium experiments will also be presented, in which direct-immersion-SPME determined the release of limonene from a micellar solution. The type and thickness of the SPME film was varied in order to access different time scales affecting the kinetics. These measurements will be discussed in the context of theories for diffusion coupled with rapid release from nanostructures.

AGFD 12 Nutritional liposomal technology: Characterization and pharmacokinetics Emek Blair, qc@empirical-labs.com, Fort Collins CO; Kelly Goyen Empirical Labs, US Many people are unable to achieve vital nutrition levels due to genetic abnormalities or health issues. Liposomal nano-technology has emerged as a promising remedy; nature uses this model to deliver life sustaining nutrition via mother's milk and pharmaceutical companies use it as a drug delivery vehicle. This study uses SEM and DLS to correlate human pharmacokinetics and pharmacodynamics to the liposome's nano-structure. This data illustrates the improved absorption and pharmacodynamics of properly structured liposomes. For instance, liposomal vitamin C can be better absorbed with reduced side effects, resulting in increased concentrations with longer residence time in blood serum as compared to a tablet form. Glutathione, an intercellular anti-oxidant with low levels being linked to autism and Alzheimer's, is usually broken down in the digestive tract making it ineffectual as a supplement; however, liposomal glutathione is absorbed whole.

AGFD 13 Delivery of nutraceuticals using self-assembled chitosan-based nanoparticles Qingrong Huang, qhuang@aesop.rutgers.edu, Dept. of Food Science, Rutgers Univ.NJ Chitosan-based self-assembled functional nanoparticles have been prepared from bioactive peptides, caseinophosphopeptides (CPPs) and chitosan (CS). The structure, conformation, and intermolecular interactions at physiological conditions and various CS/CPPs mass ratios have been systematically studied using a combination of liquid chromatography-tandem mass spectrometry (LC-MS-MS), turbidimetric titration, dynamic light scattering (DLS), electrophoretic mobility (zeta-potential), transmission electron microscopy (TEM), and fluorescence spectroscopy. Our results showed that, at low salt concentration, an increase of CS/CPP mass ratio shifted the critical pH_c, which designated as the incipient of CS/CPP nanocomplex formation, and pH_{max}, which represented the neutralization of positive and negative charges, to higher pH values. The binding between the peptides and chitosan was mainly driven by electrostatic and hydrophobic interactions, and the polymer-CPPNP binding constant was 5.4x10⁴M⁻¹. The improved antioxidant activities of tea polyphenols through nanoencapsulation using CPPs/CS nanoparticles were demonstrated by cellular antioxidant assay.

AGFD 14 Flavor chemistry of roasted peanuts Chi-Tang Ho, ho@aesop.rutgers.edu, Dept. of Food Science, Rutgers Univ., NJ, Both volatile and non-volatile compounds of roasted peanuts were analyzed. A high performance liquid chromatography method was used for the determination of (polyhydroxyalkyl)pyrazine (PHAP) compounds in peanuts. A purge-and-trap gas chromatography-mass spectrometry method was used to identify the volatile compounds in peanuts. Many alkylypyrazines such as 2,5-dimethylpyrazine, 2,-dimethylpyrazine, trimethylpyrazine, 2-ethyl-3,5-dimethylpyrazine and 3-ethyl-2,5-dimethylpyrazines were identified. In general, results showed that the levels of both PHAP and alkylypyrazine compounds increased with both time and temperature, reaching a maximum at the longest roast time and highest temperature. There was no indication that the PHAP compounds formed during roasting decomposed to form alkylypyrazines. Other important compounds formed during roasting included dimethyl disulfide, dimethyl trisulfide, acetoin, maltol, furaneol, 2-acetyl-1,4,5,6-tetrahydropyridine, 4-methyl-5-hydroxymethylthiazole and 2,4-decadienal.

AGFD 15 Significance of grinding methodology and extraction parameters on the assay of phytochemicals in foods and nuts Devanand L Luthria, D.luthria@ars.usda.gov Beltsville MD; Ayaz Memon Beltsville Human Nutrition Res. Ctr., USDA, ARS, Beltsville MD Nat'l Ctr. of Excellence in Analytical Chemistry, Univ. of Sindh, Jamshoro, Pakistan Sample preparation is often considered to be trivial by most researchers. It plays a critical part in accurately quantifying the amount of phytochemicals present in grains, seeds, nuts, and other food products. This presentation will discuss the influence of grinding and extraction methodology on the assay of crude fat content in seeds, grains, and nuts. In addition, significance of other sample preparation parameters such as storage, drying, and extractions on the assay of phenolic compounds and their antioxidant capacity will also be presented. Results generated using various foods as model substrate indicate that optimization of sample preparation parameters such as grinding, drying, storage conditions, extraction techniques, solvent composition, temperature, solid-to-solvent ratio, and time are essential for accurate quantification of phytochemicals in different plant products. Accurate quantification will allow researchers to establish proper safety and dietary intake guidelines.

AGFD 16 Phenolic constituents and antioxidant capacities of U.S. pecans Ronald B. Pegg, rpegg@uga.edu ; Phillip Greenspan; Agnieszka Kosinska; Ryszard Amarowicz; Ronald R. Eitenmiller Dept. of Food Science & Technology, The Univ. of Georgia, Athens Dept. of Pharmaceutical and Biomedical Sciences, The Univ. of Georgia, Athens Division of Food Science, Institute of Animal Reproduction and Food Research of the Polish Academy of Sciences, Olsztyn Poland Epidemiological studies have shown an inverse relationship between tree nut intakes and chronic diseases. Because Georgia is the largest producer of pecans, commercially-viable U.S. cultivars were assessed. Mean α-, β-, γ-, and d-tocopherol levels of 1.2, 0.8, 22, 0.6 mg/100 g, respectively, were found with β-sitosterol being the dominant phytosterol at 128 mg/100 g. Acetonic extracts of defatted pecans possessed marked in vitro antioxidant capacities, but cultivar played a key role. Depending on the variety, H-ORACFL values ranged from 11,000 to 24,000 μmol Trolox eq/100 g. The procyanidins content of crude extracts (348 to 931 mg procyanidin B2 eq/100 g) correlated better with H-ORACFL data than TPC values. RP-18 HPLC of fractions showed the presence of gallic, ellagic, caffeic, and chlorogenic acids as well as the proanthocyanidin monomers

catechin and epicatechin. NP-HPLC revealed that the tannin-rich fraction, which accounted for most of the antioxidant activity, comprised both hydrolyzable and condensed tannins.

AGFD 17 Walnuts combine superior phenolic antioxidant content and proven health benefits Joe Vinson, vinson@scranton.edu; Yuxing Cai. Dept. of Chem., Univ. of Scranton, PA Treenuts (walnuts, pistachios, almonds, Brazil nuts, pine nuts, cashews, macadamias, pecans, macadamias) contain nutrients including vitamin E, minerals, MUFA and PUFA (specifically alpha-linoleic acid ALA). We measured free and total polyphenols by a single step Folin assay. Walnuts ranked first among nuts in phenolic antioxidant content. Walnuts were highest in PUFA and phytosterols. We also measured the quality of the antioxidants based on our "heart disease in a test tube" model. Nuts were 4-15 times better than vitamin E. Considering both quantity and quality of phenolic antioxidants, walnuts were superior to other nuts. In human supplementation studies walnuts improved endothelial function, lipid profiles, blood pressure, blood pressure under stress, and antioxidant capacity without weight gain. Consumption of treenuts is associated with a high quality diet with respect to health. Nuts are under-consumed but furnish 8% of the polyphenols in the ave. US diet with walnut #1 among the tree nuts.

AGFD 18 Phenolics and antioxidant activity of Brazil nut Fereidoon Shahidi, fshahidi@mun.ca, St. Johns Newfoundland Canada ; Jenny Ann John Dept. of Biochemistry, Memorial Univ., St. Johns Newfoundland, Canada Soluble phenolics from kernel and brown skin and whole Brazil nuts were extracted using 70% acetone under reflux conditions. Insoluble-bound phenolics were subsequently extracted into diethyl ether-ethyl acetate mixture (1:1, v/v) after alkaline hydrolysis. The content of soluble phenolics in brown skin was 1236.07 mg/100g as compared to 406.83 mg/100g in kernel and 519.11 mg/100g in whole nut. Bound phenolics content of brown skin was also 86- and 19-folds higher than kernel and whole nut, respectively. Similarly extracts from the brown skin exhibited the highest antioxidant activity. Free- and bound-phenolics were identified and quantified; these included nine phenolic acids and flavonoids and their derivatives (gallic acid, galocatechin, protocatechuic acid, catechin, vanillic acid, taxifolin, myricetin, ellagic acid, and quercetin). However, some phenolics were present only in the bound form. Furthermore, the phenolics were dominant in the brown skin.

AGFD 19 Potential antidiabetic in vitro effect of blueberry varieties grown in southern Illinois Anita P Lucius, lucius1@illinois.edu, Urbana Illinois ; Michelle Johnson; Elvira de Mejia Dept. of Food Sci. & Human Nutrition, Univ. of Illinois at Urbana-Champaign, Diabetes is the sixth leading cause of death in the U.S., affecting over 18 million people. Blueberry consumption has demonstrated significant improvements in total plasma antioxidant capacity and glucose metabolism in both healthy subjects and those with existing metabolic risk factors. The objective of this research was to study the potential role of antioxidant capacity and total polyphenol content of blueberry varieties on in vitro α -amylase and α -glucosidase inhibition as biomarkers of anti-diabetic effects. Results showed blueberries have significant hypoglycemic effects (36.4-85.0% α -amylase inhibition and 65.3-154.5% α -glucosidase inhibition compared to 1 mM acarbose). In addition, high antioxidant capacity (5.9-11.0 μ mol Trolox equivalent / g blueberries) and high total polyphenol content (0.39-1.00 g gallic acid equivalent / g blueberries) were observed. These results suggest that high antioxidant capacity and high total polyphenol content could contribute to the hypoglycemic effects in blueberries, making them a desired natural source for diabetes prevention.

AGFD 20 Determination of the substrate action pattern of an Aspergillus nidulans pectin methylesterase James W. Miller, bsavary@astate.edu.; Prasanna Vasu; Brett J. Savary Arkansas Biosciences Institute, Arkansas State Univ., Jonesboro AR College of Agriculture and Technology, Arkansas State Univ., Jonesboro AR US Pectin methylesterases (PMEs) from *Aspergillus niger* and *A. aculeatus* are used widely for fruit and vegetable processing and juice extraction. A novel PME gene identified from the genome of *A. nidulans* (AN3390.2) was expressed in *Pichia* cells, and biochemical characterization of the enzyme indicated a novel alkaline pH optimum. We now hypothesize this *A. nidulans* PME acts on pectin substrates in a block-wise action pattern. This pattern is typical of plant PMEs, in contrast to the random-action pattern characteristic of currently available *Aspergillus* PMEs. The hypothesis is being tested with a functional assay based on introduction of calcium sensitivity into a non-calcium sensitive pectin following limited de-esterification with *A. nidulans* PME. Summary results of the enzyme's properties will be presented with evaluation of its action pattern, which will include comparison to control experiments with sweet orange and *A. aculeatus* PMEs.

AGFD 21 Effect of flavonoid structure on the rate of reduction of the nitrite ion Kimberly A Hibshman, kah003@lvc.edu; Donald Dahlberg Dept. of Chemistry, Lebanon Valley College, Annville Pennsylvania, US Flavonoids are a class of antioxidant compounds that have been shown to have numerous health benefits such as lowered blood pressure and a reduced risk of heart attacks, stroke and specific cancers. A major role of such antioxidants is the production and protection of nitric oxide, which is a multifunctional free radical that is involved in the regulation of many cell, blood vessel and nerve functions. The literature has shown that even before the flavonoids enter the blood stream, they are capable of aiding in the production of nitric oxide in the digestive system. Certain flavonoids have been shown to increase the rate of reduction of nitrites to nitric oxide at low pH in vitro and in the stomach. Little has been done to explore the ability of the various subclasses of flavonoids to reduce nitrites in the stomach environment. The rates of in vitro reduction of sodium nitrite in simulated gastric juice have been measured in our laboratory for representative members of the subclasses of flavonoids including flavonols, flavones, flavon-3-ols, flavanonols, and flavanones. The observed rates for these flavonoid subclasses is in contrast to the ease of oxidation of these same compounds as shown in the literature by cyclic voltammetry and theoretical calculations. A pH dependent mechanism is proposed to explain this inconsistency.

AGFD 22 Inactivation of Saccharomyces cerevisiae in apple juice using nonthermal approaches Abigail E Moody, abigail.moody@email.wsu.edu, Gretchen Marx; Daniela Bermudez; Barry G Swanson Dept. of Microbiological Sciences, Washington State Univ., Pullman Dept. of Biological Sciences, Washington State Univ., Pullman WA Dept. of Food Science, Washington State Univ., Pullman WA Nonthermal technologies for food processing represent an option to ensure the microbial safety and to retain the quality of food products. The objective of this research was to evaluate the inactivation of *S. cerevisiae* in apple juice using High Hydrostatic Pressure (HHP), Pulsed Electric Fields (PEF), or Ultrasound (US). HHP conditions were from 300-600 MPa, 21°C, and holding times from 1 to 7 min; PEF were applied at 15 and 20 kV, 20 and 40°C for 6 to 21 pulses. US was tested at 120 mm, 50 and 60°C for 30 min. HHP

inactivated around 6 logs at the highest pressure after 3 min. PEF treatments were approximately equivalent, inactivating 5 logs of yeast after 21 pulses. US inactivated 5 logs at 60°C. HHP, PEF, and US provide excellent nonthermal pasteurization technologies for apple juice.

AGFD 23 Insecticidal properties of Terminalia arjuna against Drosophila melanogaster Miles Marnell, dharp@newpaltz.edu; Yan Li; Aaron Haselton Chemistry, State Univ. of New York, New Paltz N.Y. Biology, State Univ. of New York, New Paltz N.Y., US Biologically safe insecticides are of great interest. Terminalia arjuna shows insecticidal properties against the moth *Spirilacta obliqua*. Bark of *T. arjuna* was extracted with ethanol to see if the growth inhibitory and feeding deterrent properties of Terminalia arjuna could be extended to the fruit fly (*Drosophila melanogaster*). The bioassay performed originally showed some positive insecticidal properties at the levels of 25, 50, and 100 mg crude extract per milliliter artificial diet. However, these concentrations prevented the proper setting of agar in the food matrix, which rendered the data inconclusive due to different conditions in the test vials. A new bio-assay utilizing a liquid artificial diet saturating a sponge media has been developed. This circumvents the need to set agar in the food media without drowning the *Drosophila* larvae. Results of this new bio-assay will be presented.

AGFD 24 Effects of storage on the anthocyanin, Vitamin C and antioxidant potential of raspberries and blackberries Samantha B. Gacasan, sgacasan@jsu.edu, Nixon Mwebi Dept. of Earth and Physical Sciences, Jacksonville State Univ., Jacksonville Alabama Recent findings in food and preventive medicine promote the use of plant source natural antioxidants in the prevention of several diseases. These natural antioxidants include phenolics, anthocyanins, vitamins, etc. which act to deter oxidative reaction in the body either before they occur or by minimizing their occurrence. Consumption of these natural antioxidants has therefore been credited for the reduction of cancers, cardiovascular diseases and even cataracts. Fruits and vegetables are excellent sources of these compounds. Raspberries and blackberries have especially been found to be rich in polyphenols, anthocyanins, and Vitamin C and have been credited to improved health in many regions. These berries are however not widely cultivated and need storage and transportation for long distances. This may alter the antioxidant potential or the fruit quality of the berries and forms the basis of this study. In this study, the effect of storage on the quality (i.e. anthocyanin content, polyphenol and Vitamin C) of raspberries and blackberries is investigated. Two spectrophotometric techniques are employed in determining the anthocyanin and antioxidant content of the berries whereas HPLC is used to quantify, the Vitamin C and total polyphenol content of the berries.

AGFD 25 Robust particle-stabilized nano-emulsions Anna Millqvist-Fureby, anna.fureby@yki.se, Karin Persson Isabel Mira ; Jonas Gustafsson YKI Institute for Surface Chemistry, Stockholm, Sweden Particle-stabilised emulsions have attracted significant attention recently. However, very few reports describe submicron droplet systems or viable ways of producing emulsions of colloidal stability. Here commercially available modified silica particles were used as the only added component to form oil-in-water emulsions characterised by monomodal droplet distributions in the range 100-250 nm, long term colloidal storage stability (>several months), non- or weakly flocculated droplets, and stability towards elevated temperatures, high ionic strengths and even dilution. The o/w emulsions are created via short protocols of micro-fluidisation processing. The effects of emulsification protocol, particle concentration, oil phase characteristics, particle/oil ratio and pH were investigated. Formation and stability of nano-emulsions were favoured by increased particle/oil ratio, longer processing time, and low water solubility of the oil. The droplet size was confirmed by cryo-TEM. Particle-stabilised emulsions with these characteristics open up for exploitation novel industrial applications, e.g., ultra-stable and surfactant-free emulsions are required.

AGFD 26 High gas barrier polymer-clay nano brick wall thin films as foil replacement technology for food packaging Jaime C. Grunlan, jgrunlan@tamu.edu, Dept. of Mechanical Eng., Texas A&M Univ., College Station TX Dept. of Chem. Eng., Texas A&M Univ., College Station TX Materials Science and Engineering Program, Texas A&M Univ., College Station TX Thin films of sodium montmorillonite clay and weak polyelectrolytes were prepared, using the layer-by-layer (LbL) assembly process, by alternately dipping a PET substrate into four different dilute aqueous mixtures (polyethylenimine, poly(acrylic acid), polyethylenimine, and montmorillonite clay). After depositing four of these quadlayers (QL), the resulting transparent film exhibits an oxygen transmission rate below the detection limit of commercial instrumentation ($< 0.005 \text{ cm}^3/\text{m}^2\text{-day}$). This level of oxygen barrier, which is unprecedented for a clay-filled polymer composite, is believed to be due to a nano-brick wall microstructure comprised of completely exfoliated clay bricks in polymeric mortar and clay layer spacing on the order of tens of nanometers. This 4 QL film has a thickness of only 51 nm and an optical transparency of 95%. When multiplying OTR by film thickness to achieve oxygen permeability, we find that these films are a better barrier than SiO_x and also rival metalized plastic film. These thin film composites could be a microwaveable foil replacement for a variety of food packaging applications. This same LbL process can be used to impart UV-resistance or antimicrobial behavior by placing the appropriate ingredients in water along with the barrier film ingredients.

AGFD 27 New approach to capture, isolate, and detect silver nanoparticles in commercial food supplements using flexible mesoporous poly(amic) acid membranes Omowunmi (Wunmi) Sadik, osadik@binghamton.edu, Michael Feurstein; Cheuk Wong Chemistry, State Univ. of New York at Binghamton, Binghamton NY, US Despite extensive reports indicating that chronic exposure may lead to adverse health effects silver nanoparticles (AgNPs) are widely used in applications ranging from cookware, tableware, nutraceuticals, and dietary food supplements. Nanoporous cavities with defined porosity that are able to coordinate an array of metal particles were created using flexible polyamic acid (PAA) membranes. The surface pore sizes were controlled via a combination of the synthesis conditions, method of desolvation and the concentrations of the polymer composition. A new capture, isolate and detect (CID) concept was tested for selective trapping or fixation of engineered silver nanoparticles that are present in commercial food supplements, including MesoSilver, Colloidal Silver and Sovereign Silver Nanoparticles. The results of the filtration characteristics of the PAA membranes showed that a size-dependent isolation at varying particle sizes could be achieved with over 98.5% removal efficiency recorded

AGFD 28 Release of volatiles from amylose inclusion complexes as a function of enzyme hydrolysis Kittiwut Kasemwong, kittiwut@nanotec.or.th, Teerarat Itthisoponkul; Uracha Rungsardthong Ruktanonchai; Wanwisa Srinuanchai; John R. Mitchell; Andy J. Taylor National Nanotechnology Center, National Science and Technology Development Agency, Thailand Science

Park, Klong-Luang Pathumthani Thailand Faculty of Agricultural Product Innovation and Technology, Srinakharinwirot Univ., Bangkok Thailand Division of Food Sciences, Univ. of Nottingham, Loughborough Leicestershire, United Kingdom Inclusion complexes with active ligands particularly flavour compounds with amylose are an emerging technique for nanoencapsulation because the natural and spontaneous tendency of amylose to form single helical molecular inclusion complexes with various ligands, in which the ligands entrapped inside the helix (overall diameter approximately 13.5 Å and an inner channel diameter of around 5.4 Å). The purpose of this research study was to better understand the influence of the structural features of amylose-flavours complexation on the volatile flavour release from complexes in response to enzymatic hydrolysis. Thus, amylose-flavour complexes (15 aromas, including linear alcohols, nonlinear alcohols and ketone compounds) from dispersed cassava starch were prepared. The formation of complexes was confirmed by wide-angle X-ray scattering (WAXS). V6 -amylose, the volatile compounds are located in the amylose helices, and V6-III -amylose, the volatiles are located within the amylose helices and also between the helices were obtained. The effect of α -amylase digestion of amylose-flavour complex was investigated by means of headspace aroma concentration using Atmospheric Pressure Chemical Ionization Mass Spectrometry (APCI-MS). The digestibilities of amylose complexes depended on time, enzyme concentration and the structure of inclusion complexes. The degree of hydrolysis of V6-III -amylose complexes was rather greater than the V6 -amylose complexes. The results obtained from this study suggest that amylose complexes provide a new line of slow release delivery system for food flavoring agents. From a technical point of view they serve as the means of providing aroma enhancement, used e.g. in gums and candies products, through longer flavour retention. Additionally, this system could be used in masking bitter taste or undesired aroma of ingredients and used as a nano delivery system for the controlled delivery of bioactives.

AGFD 29 Increasing the association of casein micelles as natural nanodelivery systems with curcumin through static high pressure processing Saeed Rahimi Yazdi, srahimi@uoguelph.ca, Univ. of Guelph Dept. of Food Science Building Guelph Ontario, Canada ; Milena Corredig; Stefania Iametti; Francesco Bonomi Food Science, The Univ. of Guelph, Canada Agri-Food Molecular Sciences, The Univ. of Milan, Milan, Italy Casein micelles incorporate avidly curcumin in their structure, and can be used as a nano-delivery system of this hydrophobic compound derived from turmeric. In this study, it was hypothesized that high hydrostatic pressure would cause a rearrangement of the casein nanoparticles that would increase the affinity of them for curcumin. It has been shown that more curcumin can be incorporated into these nanoparticles by applying static high pressure at three different levels (200, 400 and 600 MPa). The molecular interactions between curcumin and the caseins were quantified by using direct fluorescence and fluorescence quenching. The binding constants and fluorescence intensity of curcumin were higher in pressurized milk than in untreated skim milk, and the greatest incorporation occurred at 400 MPa. The increased capacity of milk proteins to bind curcumin after high pressure can be attributed to the disruption and rearrangement of the structure of casein micelles and to denaturation of whey proteins.

AGFD 30 Bioactive compounds from okra seeds: Potential activators of sirtuin as therapeutics for age related diseases Bishambar Dayal, dayalbi@umdnj.edu; Jasmine Desai ; Ashwin Baweja; Marie Thiath; Michael Lea Medicine, UMDNJ-New Jersey Medicine School, Newark NJ UMDNJ-Graduate School of Biomedical Sciences, Stratford NJ North Brunswick High School NJ, Essex County Community College, Newark NJ Biochemistry and Molecular Biology, UMDNJ-New Jersey Medical School, Newark NJ Okra vegetable is a valuable source of micronutrients and nearly half is present in a soluble fiber form which helps to lower serum cholesterol reducing the risk of heart disease. The other half contains insoluble fiber which keeps intestinal tract healthy avoiding colon cancer and inflammatory bowel disease. Recently we reported that bioactive compounds from Okra Seeds may serve as potential inhibitors of advanced glycation end products (AGE's) and thus avoid macrovascular/microvascular complications in diabetes and cardiovascular disease (ACS March 2009, August 2010). The present studies will highlight whether these small molecules present in okra are sirtuin (a protein) activators and may cross the blood-brain barrier and thus may play a significant role in treating Alzheimer's and other neurodegenerative diseases. To elucidate the therapeutic potential of SIRT1 activation for treatment of age-related diseases we have initiated a program to identify and characterize novel small molecules from common vegetables. To this end we have screened and determined cellular antioxidant activity of 21 different fruits and vegetables. Since quercetin and piceatannol, resveratrol are plant polyphenols and are from a library of small molecules. that include flavones, stilbenes, flavanones, isoflavanones and they stimulate SIRT1. We believe, our compounds present in Okra Seed are structurally diverse similar compounds may stimulate the sirtuin activity and will be beneficial for age-related diseases.

AGFD 31 Production and characterization of resistant starch from Hylon VII with pullulanase and heat-moisture treatment Qunyu Gao, qygao@scut.edu.cn, Carbohydrate Laboratory, College of Light Industry and Food Sciences, Guangzhou China ; Suling Li; Xiacong Deng College of Light Industry and Food Sciences, South China Univ. of Technology, Guangzhou China Dept. of Food Control, Orion Food Company, Guangzhou China Abstract: Resistant starch (RS) is considered to be healthful food for human beings. The objective of this study was to utilize heat-moisture treatment (HMT) and pullulanase to prepare RS from high-amylose corn starch (Hylon VII). Hylon VII was subjected to HMT with 25% moisture at 110 °C for 10h and yielded 51.45% RS. When 30% of starch suspension was debranched with 50ASPU/g (dry starch) pullulanase, RS yielded to 51.03%. Afterwards, the debranched starch was treated to HMT, RS increased to 55.09%. HMT and pullulanase treatment did not change birefringence and granular shape of starch, and increased amylose content. Native and modified starch showed "A" type pattern but crystallinity decreased after treatments. Hence, the combination of debranching and HMT could enhance RS as a natural and economical method. Key words: High amylose corn starch, heat-moisture treatment, pullulanase, resistant starch

AGFD 32 Folate in cereals: Possibilities to enhance folate intake from cereal foods Vieno Piironen vieno.piironen@helsinki.fi.; Minnamari Edelmann Susanna Kariluoto Dept. of Food and Environmental Sciences, Univ. of Helsinki, Finland Folate intakes often fall below recommendations in countries, which do not practise mandatory fortification with folic acid. In those countries, non-fortified cereal foods are important folate sources accounting for example in Finland for ca 40% of the total folate intake. Improving cereal foods as folate sources further would thus have practical relevance. Results of a comprehensive European Healthgrain project showed that bread wheat had comparable folate levels with oats, whereas durum wheat, rye and barley had somewhat higher contents. In comparison of 150 wheat genotypes the best folate sources contained 2-fold more folate than the poorest sources.

However, environmental factors affected folate contents more strongly than genetic factors. Uneven distribution of folate in grains can be exploited in production of folate-rich fractions. Wheat fractions with 1.4-7.5% ash differed 6-fold in their folate levels. Further, enhancing folate levels by bioprocessing, i.e. germination/malting and fermentation, offers interesting further options.

AGFD 33 Do you like fresh bread? The impact of process on selected quality and nutrition parameters — key results from the EU-FRESHBAKE project Alain LE-BAIL alain.lebail@oniris-nantes.fr, Dept GEPEA-UMR CNRS 6144, ONIRIS, NANTES France Bread is a staple food, which is very important for the human diet. Mass production of bread can be done either with conventional technologies (fully baked) with delivery to vending places. The bake off technology (BOT) consists in producing bread from industrial refrigerated or frozen or non frozen bakery goods and to retail them in downtown baking shops or to make them available in supermarket for domestic baking. In order to improve the quality of BOT products, a collaborative European research project (EU-FRESHBAKE - 2006-2009) has been funded (12 partners). It will be presented; its objectives aimed at improving the nutritional properties of bake off technology products while reducing the energy demand. A focus is done on the partial baking and on frozen dough technologies. Selected results will be presented: - Impact of the baking process and of the formulation on glycaemic index - Impact of baking conditions on bread staling - Impact of freezing on the activity of phytase enzyme - Impact of freezing on bread aroma A brief focus will be done on the impact of the processing conditions on the energy demand. in connections with the quality of the products. Note: This presentation is done within the frame of the AGRIFOODRESULTS European project (FP7- Grant Agreement 226927) aiming at communicating the results of European projects toward the industry. It does not necessarily reflect the views of the European commission and in no way anticipates the Commission's future policy in this area.

AGFD 34 Autohydrolysis of cereal bran for the production of feruloylated arabinoxylooligosaccharides Devin Rose drose3@unl.edu, George Inglett Dept. of Food Science & Technology, Univ. of Nebraska-Lincoln, Lincoln NE, Agricultural Research Service, USDA, Peoria IL Cereal brans are rich sources of dietary fiber and phenolic antioxidants. The chief portion of dietary fiber in cereal brans are insoluble arabinoxylans, which are cross-linked via ferulate bridges. Because many functional properties and health benefits of dietary fiber rely on solubility and microbial fermentation, it is desirable to develop strategies to solubilize the arabinoxylans in cereal brans. Autohydrolysis describes the process of subjecting cereal brans to high temperatures (160-220 °C) in the presence of water, releasing a portion of the insoluble arabinoxylans in the form of feruloylated arabinoxylooligosaccharides. Using different processes for treating corn bran and wheat bran, 50 and 70%, respectively, of the insoluble arabinoxylan can be released from these products as arabinoxylooligosaccharides. These oligosaccharides retain substantial antioxidant activity due to the presence of the feruloyl moiety.

AGFD 35 Adding value to holy grain — providing the key tools for the exploitation of amaranth, the protein-rich grain of the Aztecs: Results from a joint European-Latin American research project Inge S Fomsgaard, inge.fomsgaard@agrsci.dk.; Carsten Christophersen; Ana Paulina Barba de la Rosa; John Délano-Frier; Dagmar Janovská Kristina Matusová; Martha L. Lacayo Romero; Javier Espinoza Pérez; Andreu Taberner; Cristina Añon; Rosa M. de Troiani; Karel Dusek; Ajax Fonseca; Per Kudsk Rodrigo Labouriau; Nora Martínez; Filip Matus ; Solvejg K. Mathiassen; Elke Noellemeyer; Hans A. Pedersen; Nilda Reinaudi ; Helena Stavelikova; Stine K. Steffensen Dept. of Integrated Pest Management, Aarhus Univ., Slagelse DK-4200, Denmark Dept. of Chemistry, Univ. of Copenhagen, Copenhagen DK-2100, Denmark Departamento de Biología Molecular, Instituto Potosino de Investigación Científica y Tecnológica, San Luis Potosi 78216, Mexico Unidad de Biotecnología e Ingeniería Genética de P, Centro de Investigación y de Estudios Avanzados del I.P.N, Irapuato Guanajuato 36500, Mexico Crop Research Institute, Prague 16106, Czech Republic AMR AMARANTH a.s., Hradec Králové 501 01, Czech Republic Biotechnology Lab, Universidad Nacional Autónoma de Nicaragua - Managua, Managua, Nicaragua Asociación Chinantlán, construyendo hermandad, Chinandega, Nicaragua Hortofruticultura, Botánica y Jardinería, Universidad de Lleida, Lleida 25198, Spain Universidad Nacional de La Plata, Centro de Investigación y Desarrollo en Criotecología de Alimentos, La Plata 1900, Argentina Facultad de Agronomía, Universidad Nacional de La Pampa, Santa Rosa La Pampa 6300, Argentina Dept. of Genetics and Molecular Biology, Aarhus Univ., Tjele DK-8830, Denmark The project AMARANTH:FUTURE-FOOD was a joint research project financed by the European Commission in the Specific International Cooperation Activities (INCO) of the 6th Framework Programme (contract no. 032263). The project group consisted of 11 partners from Mexico, Nicaragua, Argentina, Czech Republic, Spain and Denmark. Amaranth is a protein-rich and gluten-free pseudo-cereal grain that was the basic food in South America and Mexico thousands of years ago. The project was initiated in September, 2006 and finalised in December, 2009. Results from our research into the contents of health promoting constituents in amaranth, the industrial use of amaranth and the use of amaranth as food, feed and food additives will be presented. Finally, we will share our experience with the audience on our end-user focus in two Nicaraguan women's agricultural cooperatives. They implemented amaranth cultivation and developed amaranth food products adapted to traditional Nicaraguan taste. <http://www.amaranth-future-food.net/Upload/Amaranth/Document/Samlet-rapport-amaranth.pdf>

Abstracts continue after the centerfold

GUIDELINES FOR ORGANIZERS OF AGFD DIVISION SYMPOSIA

1. Goals of AGFD symposia - Symposia topics should address research of importance, bringing together scientists from diverse disciplines, but with common interests, to focus on the most current data on a single topic.

2. Proposing symposia - The best time to propose a symposium is 18 to 24 months before the expected presentation date, at a Future Programs meeting, held at a national meeting. Symposia organizers should consider logical locations for symposia - e.g. a symposium on citrus in Florida or on wine in California. It is useful to have a co-organizer to share the workload. The Program Chair or experienced symposium organizers can provide examples of letters for inviting speakers, soliciting funds and proposing a book deal. The Program Chair lists all symposia as 'open to all submissions' unless specifically instructed by the organizers to list it 'invited papers only'. The Graduate Student Symposium is an exception - papers are always by invitation only. A list of planned future symposia appears in *the Cornucopia* and at the AGFD website. At each Future Programs meeting the Program Chair will ask organizers for confirmation that their symposium still on and for an estimate of the number of speakers expected.

3. Funding Symposia - If organizers anticipate the need for funding, the organizers must present and justify a budget to the Program Chair at least one ACS meeting before the symposium date. Organizers are responsible for operating within their approved budget. AGFD funding is based on the needs of the program, not the needs of the speakers or a desire to fund all speakers equally. That a speaker is from academia and therefore needs funding is not a valid argument. The maximum Division support a speaker may receive is 1/2 round trip coach airfare, two days per diem, and registration. AGFD does not pay speakers honoraria and will not fund symposia that do, even if the organizer pays honoraria from other funds. The Division may provide a symposium organizer no more than \$750 per half day session. All speakers must register for the ACS meeting. Registration costs can not be waived - (exception: 50-year and unemployed members) someone has to pay - either the speaker or the symposium budget. Many speakers only need a single day registration (typically < 1/2 the cost of a full registration). Don't offer to pay for a speaker registration in advance as if they don't show the money is spent for nothing. Speakers working for industry should not request or be offered reimbursement as the Division will not reimburse industrial speakers.

Symposium organizers should investigate sponsorships from industry, the USDA and possibly NRI grants. For symposia largely by and for ACS industry members the ACS Committee on Corporation Associates is a potential funding source. Organizers should mention sponsor names in symposium announcements. Sponsor logos can appear on promotional literature. If your organization forbids soliciting money, the Program Chair can sign a letter you prepare to request support from a potential funding source. Organizers do not need to establish a bank account for symposia funds as AGFD has well established procedures for collecting, recording and distributing symposia funds. Make funding checks out to the 'Agricultural and Food Chemistry Division of ACS'. Send checks to the AGFD treasurer (Cynthia Mussinan, AGFD Treasurer, IFF R&D, 1515 Highway 36, Union Beach, NJ 07735) with an explanation as to its intended use. Organizers should identify to the Program Chair and Treasurer those speakers for whom registration and travel fees are to be paid. Only speakers, organizers, and/or session chairs may receive reimbursement. Reimbursements do not take place until at the meeting itself - so that only speakers that appear at the meeting receive funds. Assist the division Treasurer and your speakers by clearly detailing and documenting all reimbursement requests. Ask speakers to submit all pertinent receipts to justify reimbursement. Reimbursements must take place soon after the meeting as the division needs to 'close its books' on a meeting.

5. Selection of Speakers - Anyone can speak. If they are not an ACS member they formally have to be invited (by the organizer) - so invite them. The AGFD Secretary (Michael.Tunick@ars.usda.gov) can provide AGFD letterhead for invitations. Choose highly-qualified, enthusiastic speakers at the forefront of their specialization. Make clear to speakers to what extent (if any) that you can reimburse their costs. Work only with speakers that have a reasonable certainty of attending the meeting. Do not promise any speaker a time or date for speaking prior to publication of the on-line technical program or the program overview in C&EN. Speakers may need to present anywhere from Sunday a.m. to Thursday p.m.

6. Publishing Symposium Proceedings - Organizers should consider publishing the proceedings of their symposium in book form, acting as editors. Symposium book royalties support future division programs. Publishers

GUIDELINES FOR ORGANIZERS OF AGFD DIVISION SYMPOSIA - continued

interested in publishing AGFD symposia include the ACS Books Department, Kluwer/Plenum, Van Nostrand Reinhold, DeGruyter, and Academic Press. The AGFD Division will ask symposium organizers to sign an agreement stating that all royalties from symposium publications, regardless of publisher, accrue to the Division. To avoid potential financial liabilities organizers must send a copy of the contract to the AGFD Treasurer PRIOR TO SIGNING. ACS Books is headed by Bob Hauserman (b_hauserman@acs.org). Bob will need a cover letter stating the purpose and scope of the symposium, an idea of the types of scientists that might purchase such a book, information such as how the book would complement or update existing publications, and a list of chapter titles with author names and affiliations organized in a tentative table of contents.

7. Gathering Abstracts and Arranging Symposium Sessions - Abstract submission deadlines are around the end of October for the Spring meeting and the end of April for the Fall meeting. The Program Chair can provide exact dates. Organizers are responsible for getting speakers to submit their abstract. Speakers use the web-based PACS program for registering abstracts and they need to set up an ACS ID account (<http://abstracts.acs.org>) if they have not already done so. The Organizer provides the Program Chair the time and order of presentation of each paper. For details on all aspects of PACS go to www.chemistry.org and then type PACS in the search field. The Program Chair reserves the right to reject or demand editing of any abstract prior to acceptance. Organizers should let the Program Chair know their preference for a particular day or days and to position their symposium so that it does not compete with another symposium for the same audience. Symposium organizers serve as the main contact for information needed by speakers. Abstracts should have only the first letter of the first word in the abstract title capitalized (like a normal sentence). Organizers use PACS to put papers in the order they desire, assign times for each speaker, include breaks and assign session presiders. As soon as the program is printed in C&EN or available on the on-line technical program, organizers must contact speakers informing them of the date and time of their presentation and reminding them to register for the meeting. Morning sessions need to end by noon as the meeting rooms are often scheduled for division business meetings. Organizers that have authors with more than one poster should remind the Program Chair to arrange the posters so that multi-poster authors receive adjacent poster boards.

9. Timeline for Symposium Organizers

18 to 24 months before meeting - Declare at Future Programs meeting your intent to organize a symposium.

12 to 18 months before meeting - ID co-organizer. ID co-sponsoring divisions. ID speakers. Solicit funds.

9 to 12 months before meeting - Draw up budget. Contact publishers.

6 to 9 months before meeting - Get abstract titles. Establish speaker time allotments. ID session presiders.

4 to 6 months before meeting - Instruct speakers to enter abstract on PACS. Review & organize abstracts on PACS.

2 to 4 months before meeting - Remind speakers to register for meeting. Register yourself.

1 to 2 weeks before meeting - Load speaker's presentations on a laptop that you bring to the meeting.

10. At the Meeting - Arrive early, check-in with the Program Chair; confirm the condition of the room, lighting and projectors. LCD projectors are the standard ACS audio-visual devices. The session chair has the responsibility to provide a laptop or obtain access to one. Get speakers to provide PowerPoint presentations on a flash drive. DVD videos with sound that play on laptops require extra audio cabling that needs preparation and testing before the beginning of a session. Ask speakers and presiders to check in with you before the session begins. Keep speakers within their time allotment. If a speaker can not make the meeting another person with an excellent knowledge of the work can present the work in their place. If the second to last paper of the day is cancelled the last paper of the day can be given in its place, if the speaker agrees to re-present the paper at the correct time should someone new show up at the correct time and want to see the paper. Encourage speakers and your audience to attend the AGFD reception. Consider buying speakers a ticket to the Fall banquet your symposium budget permits.

11. After the Meeting - Thank speakers and financial supporters for their contribution to a successful symposium. Work with the speakers and the AGFD Treasurer to close out all reimbursements related to the symposium.

For a manual on ACS Programming Policies go to the the ACS website and click through -
/Membership&Networks/TechnicalDivisions/OfficerInformation/Operations/ProcedureManuals

AGFD abstracts - continued

AGFD 36 Immunolabelling of xylan side groups – a novel 4-O-methylglucuronic acid specific antibody Maija Tenkanen, maija.tenkanen@helsinki.fi.; Sanna Koutaniemi; Fabienne Guillon; Brigitte Bouchet Oliver Tranquet; Luc Saulnier Dept. of Food and Environmental Sciences, Univ. of Helsinki, Finland Biopolymères, Interactions & Assemblages, Recherche Agronomique (INRA), Nantes France Xylans are abundant polysaccharides with heterogeneous structures that depend on the plant species. They can be found both in angiosperms (20-35%) and gymnosperms (8-14%). The main structure of xylans consists of linear β -(1 \rightarrow 4)-D-xylopyranosyl backbone that is randomly substituted by a-(1 \rightarrow 2)-linked (4-O-methyl)glucopyranosyluronic acid (MeGlcA) and acetyl (angiosperms) or a-(1 \rightarrow 3)-linked L-arabinofuranosyl (L-Araf) residues (gymnosperms). The xylans in monocots endosperm contain mostly L-Araf residues. Antibodies are specific tools to study the structure and localisation of plant cell wall polysaccharides in situ. We have succeeded in raising a novel monoclonal antibody against MeGlcA substituents in xylans by using MeGlcA-xylobiose as an antigen. The antibody was found to recognize only xylans with MeGlcA groups and that acetylation of xylan restricted the recognition. The labelling pattern of different plant samples will be presented. In addition, the concept of production of side-group specific antibodies will be discussed in the present paper.

AGFD 37 Refrigeration of prefermented bread dough: Impact on volume change and bubble distribution in dough and in baked bread Domagoj Gabric, domgabric@gmail.com Fadhel Ben-Aissa; Duska Curic; Sylvie Chevallier Alain Le-Bail. Dept. of Food Engineering, Faculty of Food Technology and Biotechnology, Univ. of Zagreb, Croatia GEPEA (UMR CNRS 6144), ONIRIS, Nantes Cedex France The freezing of prefermented dough permits to shorten the preparation time of frozen semi-finished bakery products. The objective of this study was to better understand the impact of the degree of prefermentation on the collapse of the cells in dough and bread and on the final bread volume. Lean bread dough rolls (70 g) were exposed to prefermentation at 30 °C. Volume expansion factor (VEF) was monitored during fermentation. After wanted VEF was achieved samples were exposed to chilling and/or freezing. The evolution of the volume of the dough during the different stages of the time-temperature history has been measured. Image analysis has been done for both prefermented dough in frozen state and baked bread. Results showed that the degree of fermentation affects the magnitude of the contraction of the dough during chilling; final volume of the bread was also affected. ANOVA showed significant effect of both VEF ($p=0.0028$) and process ($p=0.0107$) on geometric standard deviation indicating that uniformity of bubble distribution decreases with increasing fermentation duration and by application of cooling and/or freezing phase.

AGFD 38 Phytoestrogenic activity of sorghum with different flavonoid compositions Liyi Yang, lyang@ag.tamu.edu Kimberly F Allred; Clinton D Allred; Joseph M Awika; Dr. Linda Dykes; Linda Dykes Dept. of Soil & Crop Sciences, Texas A&M Univ., College Station TX Dept. of Nutrition & Food Science, Texas A&M Univ., College Station TX Evidence indicates sorghum may be protective against colon cancer; however, the mechanisms are unknown. Estrogen is believed to protect against colon cancer development by inducing apoptosis in damaged non-malignant colonocytes. Three sorghum extracts (White, Red and Black) were screened for estrogenic activity using cell models expressing estrogen receptor α (ER α) and ER β . Black and White sorghum had significant estrogenic activity mediated through both estrogen receptors at 5 and 10 $\mu\text{g/mL}$, respectively; but Red sorghum did not. Further evidence showed that the same treatments led to induction of apoptosis in cells expressing ER β . Flavones with estrogen-like properties, luteolin and apigenin, were detected in White and Black sorghums, but not in the Red sorghum. On the other hand, naringenin, a flavanone known to interfere with transcriptional activities of estrogen, was only detected in the Red sorghum extract. The Black sorghum extract also contained high amounts of 3-deoxyanthocyanins, which were absent in the White sorghum. Future studies will identify the bioactive compounds.

AGFD 39 Technologies to recovery multiple coproducts in corn dry grind ethanol production Vijay Singh, vsingh@illinois.edu, Agricultural and Biological Engineering, Univ. of Illinois at Urbana-Champaign, Urbana IL Several corn dry and wet fractionation methods have been proposed to recover germ and fiber as sellable coproducts prior to fermentation in dry grind process. In dry fractionation, a dry degerm defiber process (similar to conventional corn dry milling) is used to separate germ and pericarp (bran) fiber prior to fermentation of the endosperm. In the wet methods, corn is fractionated in an aqueous medium (similar to conventional corn wet milling) to separate and recover germ, pericarp and/or endosperm fiber prior to fermentation. Corn fractionation prior to fermentation helps increase plant throughput, improve fermentor productivity, reduce the amount of DDGS produced and recover additional coproducts. Some of these coproducts can be used as feedstock for producing nutraceuticals and gums that have applications as food and industrial products. These technologies are being implemented in dry grind ethanol industry and currently there are five commercial dry grind ethanol plants using dry fractionation and one plant using wet fractionation process. Comparison between the two fractionation processes in terms of fermentation profiles and coproduct composition will be discussed.

AGFD 40 Composition and bioactivity of okra seed extracts: Effect on colon cancer cells Sandhya Bolikal, dayalbi@umdnj.edu., Bishambar Dayal; Tyler Anderson; Charles desBordes; Michael A. Lea Biochemistry & Molecular Biology, UMDNJ - New Jersey Medical School, Newark NJ Medicine, UMDNJ - New Jersey Medical School, Newark NJ Biology, City Univ. of New York, The composition and biological activity of methanolic extracts of okra was investigated. A higher concentration of phenolics in extracts of seeds rather than in other tissues was confirmed and correlated with antioxidant activity. Inhibitory concentrations of seed extracts for protein synthesis and thymidine incorporation into DNA of colon cancer cells were established. In one cell line (HT29) there was a biphasic relationship to concentration after a 48 hour incubation with stimulation at low concentrations. In Caco-2 cells, but not in HT29 and SW1116 cells, okra seed extracts increased the activity of a differentiation marker, alkaline phosphatase. The effect was additive with the action of butyrate. Smaller responses were seen for dipeptidylpeptidase and aminopeptidase activities. After reconstitution in water, activity was largely retained on a C18 column and was eluted sequentially with ethyl acetate and with 95% methanol, 5% formic acid. The data suggest a potential cancer chemoprotective role for okra.

AGFD 41 Encapsulation of EGCG within novel nanoparticles assembled from bioactive peptides and chitosan Bing Hu hubing212002@yahoo.com.cn.; Yuwen Ting ; Wenping Tang; Xiaoxiong Zeng; Qingrong Huang Food Science, Rutgers Univ., New Brunswick New Jersey Food Science, Nanjing Agricultural Univ., New Brunswick New Jersey Nanochemoprevention, encapsulation of naturally occurring phytochemicals in bio-nano-materials, has already been introduced as a novel approach for cancer control. In present study, epigallocatechin gallate (EGCG) was encapsulated in novel nanoparticles assembly from bioactive peptides, caseinophosphopeptides (CPPs), and chitosan (CS), with the particle size around 150 ± 4.3 nm, surface charge of 32.2 ± 3.3 mV. Atomic force microscopy (AFM) image showed that EGCG loaded CS-CPP nanoparticles were regularly spherical in shape. Cross-linking between the $-\text{NH}_3^+$ groups of chitosan with the $-\text{P}=\text{O}-$ and $-\text{COO}-$ groups of CPP, as well as the hydrogen bonding were confirmed from the FT-IR analysis results. Encapsulation efficiency of EGCG in CS-CPP nanoparticles ranged from 70.5 to 81.7%, almost one hundred percentage higher than that in our previous CS-TPP nanoparticles (25.84-47.37%). Meanwhile, the burst release of EGCG (23-40% at 12h) has already been slowed down in a more controllable manner in CS-CPP nanoparticles compared with that released from CS-TPP nanoparticles (45-60% at 12h). In addition, introducing peptides, instead of TPP, decreased the cytotoxicity of CS nanoparticles significantly ($p < 0.05$). Encapsulated in both CS-CPP (TPP) nanoparticle, the cell antioxidant activity of EGCG has been increased significantly ($p < 0.05$) by 17.75% and 27.93% respectively, which indicated the enhanced bioavailability of the EGCG as nanochemoprevention.

AGFD 42 Biomass refining system via alkaline hydrothermal treatment technology: Catalyst development Nathaniel S Hansen , nsh38@cornell.edu; Jeanne E Panels; Alissa Park; Yong L Joo School of Chemical and Biomolecular Engineering, Cornell Univ., Ithaca NY Earth and Environmental Eng. and Chem Eng., Columbia Univ., New York Here we propose to develop a farm-scale biorefining system that can convert cellulosic biomass into useable hydrogen gas. In particular, we focus on the development of cost-effective procedures for biomass pretreatment and catalysts for alkaline hydrothermal treatment, which is less studied as compared to conventional gasification and pyrolysis but with great potential. While we have made progress in chemical routes to directly incorporate catalysts into cellulose, one-dimensional materials also have been investigated to support catalysts thereby maintaining the nanoparticles' high surface area to volume ratio while inhibiting their aggregation tendency. Electrospinning in particular has garnered significant interest due to the cost effective nature and diversity of materials/morphologies available. In this study inorganic silica nanofibers with in-situ formed iron or nickel catalytic nanoparticles have been fabricated through sol-gel chemistry with a metallic precursor and subsequent thermal treatment. Both monoaxial and coaxial nanofibers have been fabricated with coaxial nanofibers deliberately tuning the catalyst location to the surface of the nanofiber. The morphology, oxidation state and crystal location are studied using scanning electron microscopy (SEM), transmission electron microscopy (TEM) and X-ray diffraction (XRD). The resulting nanofibers were applied as a catalytic system for the alkaline hydrolysis of biomass to selectively produce hydrogen with minimal carbon monoxide or dioxide byproducts. Preliminary results indicate that nickel is significantly more efficient at catalyzing this reaction than iron, a nearly 100% conversion can be achieved through the use of high alkaline and high catalyst ratios, and that a fourfold decrease in the catalyst required to maintain conversion is achieved by tuning the catalyst location to the surface of the nanofiber. With these preliminary results, this system is especially exciting because it lends itself easily to the potential on site, cost effective generation of useable fuel gas from a biomass feed stock.

AGFD 43 Polyaniline-coated magnetic particle-based disposable biosensor for rapid extraction and detection of Escherichia coli O157:H7 Evangelyn C Alocilja , alocilja@egr.msu.edu; Parul Jain Biosystems and Agricultural Engineering, Michigan State Univ., East Lansing MI 48824, US A disposable biosensor was developed for rapid extraction as well as sensitive and specific detection of Escherichia coli O157:H7 from water and milk samples. Polyaniline-coated magnetic particles modified with E. coli O157:H7-specific antibodies were used for rapid extraction. Electrochemical detection of captured pathogen occurred via sandwich immunoassay using screen-printed carbon electrodes modified with E. coli O157:H7-specific antibodies. The presence of the pathogen was confirmed by cyclic voltammetry response of polyaniline at a potential of 0.3 V. The total assay time was 40 minutes for extraction and 50 minutes for preparation and detection. Concentration of E. coli O157:H7 from 101CFU/mL to 108 CFU/mL could be detected. Moreover, the biosensor shows specificity for E.coli O157:H7 when tested in the presence of E. coli O55:H7 and Shigella boydii. This rapid, sensitive and specific method can likely be adapted for other pathogens and shows promise for biodefense, food and water safety applications.

AGFD 44 Surface enhanced Raman spectroscopy in rapid detection of live and dead Salmonella cells Jaya Sundaram, jaya.sundaram@ars.usda.gov, Bosoon Park; Arthur Hinton; Seung Chul Yoon; William R Windham; Yiping Zhao; Kurt C Lawrence USDA, ARS, Russell Res. Ctr., Athens GA Dept. of Physics and Astronomy, The Univ. of Georgia, Athens Surface Enhanced Raman Spectroscopy (SERS) can detect food pathogens rapidly and accurately. In this study silver nanosubstrate was used for the Salmonella typhimurium bacteria. Silver nanorods were deposited on the thin titanium over the glass plates. Bacteria cells were prepared in the forms of freeze dried dead and live cells. These cells were loaded on the substrate and spectra were recorded using confocal Raman microscope. The cells were exposed to laser diode at 785 nm excitation and object 50x was used to focus the laser light on the sample. Raman shifts were obtained from 0 to 3500 cm^{-1} . Spectral signatures of the freeze dried dead and live cells were compared to differentiate them. Also the non freeze dried live cells were compared with the dried cells. The results showed that SERS could differentiate the live and dead bacteria cells present in food samples.

AGFD 45 Single template detection of food-borne pathogenic bacterium Listeria monocytogenes Jing Zou, jzz0016@auburn.edu.; Omar A Oyarzabal ; Jong W Hong Materials Research and Education Center, Dept. of Mechanical Engineering, Auburn Univ., Auburn Alabama Dept. of Biological Sciences, Alabama State Univ., Montgomery Alabama We develop a new method for the detection of a food-borne pathogenic bacterium Listeria monocytogenes by using microfluidic platforms that performs digital PCR as well as low temperature gene amplification. The detection sensitivity of a single template was accomplished through an array of reactors in nanoliter volumes. Reliable detection and accurate enumeration of a single copy with purified genomic DNA and inactivated L. monocytogenes cells was demonstrated within two hours. This methodology could be applied to detection of other food-borne bacterial cell and pathogenic agents that cause influenza, cholera, malaria, etc.

AGFD 46 Relative emission patterns of ambient almond orchard volatiles and associated navel orangeworm

chemoreception and in vitro ovipositional behavior John J Beck john.beck@ars.usda.gov; Douglas M Light Bradley S Higbee; Wai S Gee Klaus Dragull. Plant Mycotoxin Research, USDA-ARS, Albany CA Dept. of Entomology, Agricultural Extension Service, UC Davis, Albany CA Paramount Farming Co., Bakersfield CA California produces 100% of the U.S. market's supply and ca. 80% of the world's requirements for almonds (*Prunus dulcis*). Ex situ and in situ collection analyses have been performed on single cultivars but are not representative of the bouquet of volatiles emitted by the combination of cultivars found in almond orchards. Recent investigations have suggested certain volatiles from almonds exhibit semiochemical characteristics for the navel orangeworm (NOW); thus, the volatile composition of an almond orchard, and correspondingly the semiochemical medium, is necessary to NOW kairomone research. The ambient volatile emissions of almond orchards containing the cultivar Nonpareil and associated pollenizers were collected at intervals during the 2009 growing season. The major VOCs were formulated into a simple synthetic blend (Blend V) and analyzed via electroantennogram (EAG) and flight tunnel bioassays. NOW antennae responded strongly to Blend V. Additionally, female NOW moths showed ovipositional preferences to Blend V.

AGFD 47 Influence of cultivar and postharvest conditions on polyphenol content and antioxidant capacity of

California almond skins Bradley W Bolling bradley.bolling@uconn.edu; Jeffrey B Blumberg; Oliver Chen Dept. of Nutritional Sciences, Univ. of Connecticut, Storrs Antioxidants Res. Laboratory, Jean Mayer USDA Human Nutrition Res. Ctr. on Aging at Tufts Univ., Boston MA The influence of cultivar, harvest year, roasting, pasteurization, and storage on California almond skins on their total phenols (TP), flavonoid and phenolic acid content (FP), and Ferric Reducing Antioxidant Power (FRAP) value was characterized. The 3-year mean polyphenol content of 7 almond cultivars ranged from 4.0 to 10.7 mg/100 g almonds. Almonds harvested in 2006 and 2007 had 13% less FP than in 2005, but their TP and FRAP values were unchanged. Cultivar, but not season, had a differential impact on individual polyphenol synthesis. Pasteurization did not significantly change TP, FRAP, or FP. Roasted almonds had equivalent FP (n = 12). Storing almonds at 4 and 23°C for 15 mo resulted in gradual increases in FP. Thus, in almond skins, polyphenol content may be more dependent on cultivar than on seasonal differences. Roasting and pasteurization may not affect almond skin FP, while storage appears to increase FP and FRAP.

AGFD 48 Influence of roasting and varietal selection on advanced glycation end-product (AGE) formation in almonds

Alyson E Mitchell aemitchell@ucdavis.edu, Gong Zhang Guangwei Huang Food Science & Technology, Univ. of California Davis, Davis CA Advanced glycation end-products (AGEs) are products of the Maillard reaction. AGEs cross-link proteins, bind to AGE-specific receptors to promote oxidative stress, and play adverse roles in atherosclerosis, diabetes, aging and renal failure. Little information is available on the levels and range of AGEs in roasted almonds. Accordingly, LC(ESI)-MS/MS methods were developed to simultaneously monitor five common AGEs including: carboxymethyl lysine (CML), carboxyethyl lysine (CEL), pyralline, argpyrimidine and pentosidine. CML and CEL were detected in both raw and roasted almonds (cv. Carmel). Pyralline was identified for the first time in roasted almonds and accounted for ~64.4% total AGEs. CML and CEL account for 12.9% and 19.7% of total AGEs respectively. Argpyrimidine and pentosidine were below the LOD in all almond samples. Free AGEs accounted for 1.3%-26.8% of total; indicating that protein-bound forms predominate. Roasting increased CML and CEL levels 186 % and 413% respectively. No significant correlation was observed between CML and CEL and roasting temperature. Mean levels of CML and CEL in nine varieties of raw almonds were 1.770 ± 0.282 mg/kg and 1.923 ± 0.649 mg/kg and increased 149.2% and 355.7% after roasting (137.8°C, 22 mins).

AGFD 49 High temperature short time roasting increases phenolics content and antioxidant activity of cashew nuts

Fereidoon Shahidi, fshahidi@mun.com; Neel Chandrasekara Dept. of Biochemistry, Memorial Univ., St. Johns Newfoundland, Canada The effect of roasting on the content of phenolics and antioxidant properties of cashew nuts and testa was studied. Phenolic contents and antioxidant activities of cashew nut phenolic extracts increased with high temperature roasting. The highest activity, as determined by the scavenging of 1,1-diphenyl-2-picrylhydrazyl (DPPH) and hydroxyl radicals as well as oxygen radical absorbance capacity (ORAC), trolox equivalent antioxidant activity (TEAC), and reducing power was achieved when nuts were roasted at 130EC for 33 min. HPLC analysis showed that syringic acid was the predominant phenolic acid followed by gallic and p-coumaric acids. Flavonoids, namely catechin, epicatechin and epigallocatechin were also present. The contents of both phenolic acids and flavonoids increased with increasing temperature. Thus, high temperature short time roasting is recommended for cashew nut processing as it effectively enhances its antioxidant activity.

AGFD 50 Walnut feeding changes hepatic metabolomic profile of mouse model of prostate cancer

Wallace Yokoyama, wally.yokoyama@ars.usda.gov; Paul A Davis Vihas Vasu; Kishore Gohil Hyunsook Kim; Imran Khan Carroll Cross Western Regional Res. Ctr., USDA, ARS, Albany CA Dept. of Nutrition, Univ. of California, Davis Dept. of Internal Medicine, Univ. of California, Davis Dept. of Pathology and Laboratory Medicine, Univ. of California, Davis Prostate cancer is the most common cancer in males and the third leading cause of death. The TRAMP (transgenic adenocarcinoma of the mouse prostate) is widely used as an animal model of human prostate cancer. Mice were fed low fat, high fat or high fat from walnut diets for 9, 18, or 24 weeks. Mice fed the walnut supplemented diets had about 1/3 lower prostate weight at 18 weeks suggesting that the walnut diet suppressed tumor growth. The liver was extracted by acidic or basic solvents and analyzed for metabolites by LC/MS. There were 266 biochemicals identified and differences were found between levels of sphingolipids, w-3 fatty acids, arachidonic acid, lactate, oxidized fatty acids, and phospholipids. Plasma low density lipoprotein was also lower in the walnut diet. These results suggest that walnuts may suppress tumor growth through changes in lipid related pathways.

AGFD 51 Overview of sorghum protein structure and cross-linking: Implications for nutritional and functional

properties of sorghum Scott R Bean, scott.bean@ars.usda.gov, USDA-ARS, Manhattan KS US Sorghum is a major food source in developing nations and is used for feed in many countries. Sorghum grain proteins have lower in-vitro pepsin digestibility than other cereals. Why sorghum proteins are less digestible than other cereals has not been completely elucidated. However, several factors have been identified that influence the digestibility of sorghum proteins including: grain structure, protein body structure, protein cross-linking,

starch properties, and phenolic content/composition. Most proteins in sorghum endosperm are found in digestion resistant spherical protein bodies that have highly cross-linked outer layers. Furthermore, cross-linking increases during cooking of sorghum, resulting in the formation of web-like structures. These structures may also influence the digestion of sorghum starch and could play a role in development of low glycemic index foods. The properties of sorghum proteins have a substantial impact on the nutritional and functional properties of sorghum for the production of human foods, feeds, and bio-industrial products.

AGFD 52 Effect of sorghum flavonoid composition on biomarkers of chemoprevention Joseph M Awika, jawika@ag.tamu.edu; Liyi Yang; Leonard Ojwang Soil & Crop Science, Texas A&M Univ., College Station TX Whole grain product market is growing due to the recognized health benefits, and the food industry is constantly looking for new grain-based ingredients with proven bioactive properties. Sorghum is an intriguing grain that is not currently used much in the western diet, but is rich in unique flavonoid compounds that have the potential to contribute significantly to disease prevention. Epidemiological evidence has shown that sorghum consumption is associated with lower incidences of some gastrointestinal (GIT) cancers. Sorghum has high levels of 3-deoxyanthocyanins, flavones, (3-deoxy)proanthocyanidins, among other phytochemicals that are known to contribute to disease prevention. Recent discoveries have revealed an additional array of compounds whose bioactive properties are unknown. Our current research involves understanding how diversity in sorghum genetics and phenolic composition influence their effect on biomarkers of disease prevention. Recent findings on the chemistry of sorghum flavonoids and their potential effect on cancer prevention will be presented.

AGFD 53 Grain sorghum and metabolic health Mark D Haub haub@ksu.edu, Human Metabolism Lab, Julie A Louk; Andrea Schrage Scott R Bean; Brad Craemer Dept. of Human Nutrition, Kansas State Univ., Manhattan Kansas Grain Quality and Structure Research, USDA - ARS, Manhattan KS Obesity and Type 2 Diabetes prevalence rates have increased exponentially. Healthcare organizations recommend eating whole grains to assist preventing those metabolic conditions. Recent clinical trials indicate that eating more whole grains may not elicit improvements in metabolic health. There is evidence that specific grains may be more likely to confer metabolic health benefits. Results from our lab indicate that flour from grain sorghum seem to elicit the greater reductions in postprandial glycemia when compared with other grains milled to the same particle size. The flour treatments were matched for available carbohydrate. There were seven treatments (six flours and a dextrose control) with blood glucose measured serially over two hours. The sumac treatment decreased postprandial glycemia to the greatest extent. These data indicate that different grains, when eaten at the same particle size and level of available carbohydrate, convey variable glycemic responses that may benefit metabolic health.

AGFD 54 Food contact material during baking: Technological and safety issues alain LE-BAIL alain.lebail@oniris-nantes.fr, bruno VEYRAND; Sophie DURAND; Hanane KADAR; Bruno LE-BIZÉC UMR CNRS GEPEA 6144, ONIRIS, NANTES, France LABERCA INRA, ONIRIS, NANTES, France Antistick baking support can be responsible of exogenous contaminants in products. An overview on antistick-coating will be presented including the regulation on food contact material in Europe. Perfluorinated antistick-coating and silicone based antistick-coating are the most used. Sticking is linked to different aspects such as recipe, baking temperature, the use of antistick fluids. A limited amount of literature exists on the real risk of transfer of fluorinated and of silicone in the food. Recent results obtained with commercial pans will be presented. Successive cooking of water and of pancakes (used as model foods) has been done. Highly sensitive measurement methods based on LC-MS/MS and/or LC-HRMS have been developed for determination of 13 perfluorinated compounds (including PFOS and PFOA) in the tested samples. Aluminium and baking paper will be introduced too. Note: This presentation is linked to AGRIFOODRESULTS European project

AGFD 55 Cereal antioxidant dietary fibre for weight management and prevention of chronic disease Vincenzo Fogliano, fogliano@unina.it; Paola Vitaglione Dept. of Food Science, Univ. of Naples Federico II, Portici, Italy This paper focuses on the antioxidant component of cereal dietary fibre starting from its chemical structure, bioavailability and biological meaning. The slow and continuous release in the gut of the dietary fibre bound antioxidants could explain many health benefits of cereals. The soluble component of cereal antioxidant dietary fibre is the most suitable vehicle to bring phenolic compounds into the lower gut. These compounds cannot be absorbed when are bound to the polysaccharide moiety, becoming available for gut microflora. Moreover, those linked to the soluble dietary fibre can be hydrolyzed by bacterial esterases and absorbed into the bloodstream where they might prevent LDL oxidation. The action of phenolic acids is combined with the prebiotic activity of cereal dietary fibre which likely explain the positive action of whole grain based diet on weight management. Data of in vitro and human studies supporting this view will be illustrated.

AGFD 56 Comparison of micellar and caco2 in vitro methods for evaluation of hypocholesterolemic properties of hydrophobically fractionated peptides from rice and soy Huijuan Zhang wally.yokoyama@ars.usda.gov, Charles Shoemaker; Luisa Cheng Wallace H Yokoyama Western Regional Res. Ctr., USDA, ARS, Albany California Dept. of Food Science, Jiangnan Univ., Albany California) Dept. of Food Sci & Tech., Univ. of California, Davis, Recently peptide hydrolysates of cereal and milk proteins have been shown to have hypocholesterolemic, hypotensive, antioxidative, immunomodulatory and other bioactive properties. Some of these biological functions are inferred by in vitro methods. The ability of peptides, sterols, and cholestyramine to displace cholesterol from bile acid micelles is widely used to screen for hypocholesterolemic properties. The bile acid micelle assay has also been combined with caco2 cells to determine if peptides interfere with the transfer of cholesterol. In this study we fractionated hydrolysates from rice and soy by hydrophobicity and determined the ability of hydrolysates to displace cholesterol from bile acid micelles and the ability of micelles to transfer cholesterol to caco2 cells in the presence of the hydrolysates.

AGFD 57 Metabolite profiling of maize grain: Differentiation due to genetics, environment, and input systems Karl-Heinz Engel, K.H.Engel@wzw.tum.de, Richard M Roehlig; Thomas Frank Chair of General Food Technology, Technische Universitaet Muenchen, Freising-Weihenstephan Germany A comparative metabolite profiling approach based on gas chromatography – mass spectrometry was applied to investigate the impact of genetic background, environment and farming practice on the chemical composition of maize (*Zea mays*) grain. The metabolite profiling protocol involved sub-fractionation of the metabolites and allowed the assessment of about 300 distinct analytes from different chemical classes (polar to lipophilic). The evaluation of the results by sound statistics allowed to

demonstrate the potential of metabolite profiling to evaluate variations in maize grain metabolite pools resulting from the interplay of environment, season and genotype and to put the results into the context of natural variability.

AGFD 58 Polyphenol content of seeds from amaranth Inge S. Fomsgaard, Inge.Fomsgaard@agrsci.dk; Stine Krogh Steffensen Åsmund Rinnan; Anne G. Mortensen; Bente Laursen; Rosa M. de Troiani; Elke J. Noellemeier; Dagmar Janovská; Karel Dusek; John Délano-Frier Andreu Taberner; Carsten Christophersen Dept. of Integrated Pest Management, Aarhus Univ., Slagelse, Denmark Dept. of Chemistry, Univ. of Copenhagen., Denmark Dept. of Food Science, Univ. of Copenhagen, Frederiksberg Denmark Facultad de Agronomía, Universidad Nacional de La Pampa, Santa Rosa La Pampa, Argentina Crop Research Institute, Prague Czech Republic Unidad de Biotecnología e Ingeniería, Centro de Investigación y de Estudios Avanzados del I.P.N, Irapuato Guanajuato Mexico Departamento de Hortofruticultura, Botanica y Jardineria, Universidad de Lleida, Lleida Spain In a cultivation experiment 18 different *Amaranthus* genotypes were cultivated in parallel in Argentina, Mexico, Spain and two different locations in the Czech Republic. The genotypes represented in the experiment were *A. cruentus*, *A. hypochondriacus*, *A. mantegazzianus* and *Amaranthus* sp. The ripe seeds were analyzed for their content of eleven polyphenols (flavonoids, hydroxybenzoic acids and hydroxycinnamic acids). The relations and variations among genotype, species and location were analyzed by principal component analysis (PCA). The flavonoid, rutin, exhibited large variations with varying location/environmental conditions whereas the flavonoid, nicotiflorin, was less affected. *A. hypochondriacus* displayed the most stable content of polyphenols between the different locations, with a high end content of flavonoids. The variations between location/environmental condition were primarily described by the variations in the content of p-coumaric acid and protocatechuic acid in the seed samples. This work was part of the European Commission sixth Framework Program, contract number 032263 AMARANTH:FUTURE-FOOD.

AGFD 59 Insect olfaction agonists and antagonists: Possibilities for behavioral control of insects Erika Plettner, plettner@sfu.ca, 8888 Univ. Dr., Burnaby B. C. V5A 1S6, Canada; Hao Chen; Yang Yu; Yongmei Gong. Chemistry, Simon Fraser Univ., Burnaby B. C. V5A 1S6, Canada Insects locate their mates or host plants by following attractant pheromones or leaf volatiles. Olfaction in insects is mediated through sensory hairs, hollow cuticular structures that are innervated by selective neurons. We are interested in "confusing" insects by using mimics of biologically relevant odorants to modulate behavioral responses. Two series of compounds were prepared and tested by electroantennogram (EAG) against gypsy moth: 1) conformationally constrained mimics of gypsy moth pheromone, (7R,8S)-2-methyl-7,8-epoxyoctadecane, and 2) mimics of aromatic plant odorants. The mimics did not elicit significant antennal responses by themselves. When puffed simultaneously with the pheromone of the gypsy moth, some compounds enhanced the antennal depolarization, whereas others inhibited it. Some compounds prolonged the stimulation of the antenna, which manifested itself in widened electroantennogram peaks. This activity showed a clear structure-activity pattern, with respect to the length of alkyl substituents. Experiments with gypsy moth pheromone-binding proteins have revealed that particular conformers appear to be stabilized by the agonists that prolong the EAG stimulation.

AGFD 60 Chemistry and applications of terpenoid pheromones of mealybugs Jocelyn G Millar, jocelyn.millar@ucr.edu, Yunfan Zou; J Stephen McElfresh; Jardel Moreira Dept.s of Entomology and Chemistry, Univ. of California, Riverside, Mealybugs are major economic pests of vineyard and fruit crops worldwide. Direct damage caused by feeding is exacerbated by the growth of sooty mold on the honeydew produced by the insects, and by the transmission of plant pathogens. The identification and synthesis of the highly irregular terpenoid pheromones of four important mealybug species (grape, vine, longtailed, and obscure mealybugs) will be described, along with the development of practical applications of the pheromones for detection, monitoring, and control of these major pests. Important aspects of the biology of the insects, such as complications caused by possible pheromone races or cryptic species, also will be discussed.

AGFD 61 Impact of kairomones on moth pest management: Pear ester and the Codling Moth Douglas M. Light, doug.light@ars.usda.gov Plant Mycotoxin Research, WRRRC, ARS, USDA, Albany California Codling moth (CM) is the major pest of apples, pears, and walnuts worldwide. Our focus is to develop novel, species-specific monitoring and control systems based on host-plant odors, kairomones. In 1998 'pear ester' (PE), ethyl (2E, 4Z)-2,4-decadienoate, was identified as a powerful kairomonal attractant of both male and female CM adults and larvae. Through 12-years of cooperative research, USDA-ARS and Trécé, Inc. have developed multiple tactics using PE to improve both population monitoring and mating disruption (MD) of adults and also insecticidal control of larvae. Supporting the axiom 'better attractants make better disruptants,' PE was shown to increase attraction of males to pheromone then demonstrated to also enhance MD. Application of PE to leaf surfaces elicits larval attraction, arrestment and prolonged wandering, thereby increasing exposure time of larvae and the efficacy of insecticides. Integrated tactics using PE are making an impact on CM management and judicious use of pesticides.

AGFD 62 From juvenile hormone mimics to analgesic and anti-inflammatory pharmaceuticals Bruce D Hammock, bdhammock@ucdavis.edu, Dept. of Entomology, Univ. of California, Davis The Chemistry Group at Zoecon Corporation in the early 1970s directed by Clive Henrick pioneered the use of insect juvenile hormone mimics (juvenoids) as green pesticides. The compounds that Zoecon developed are marketed today inspiring other laboratories to explore juvenoids for insect control. While investigating the mammalian metabolism of an epoxide containing juvenoid, Sarjeet Gill and I found a soluble epoxide hydrolase (sEH) which converts terpene and fatty acid epoxides to their diols. Fatty acid epoxides and sometimes the diols are potent chemical mediators in mammals like juvenile hormones in insects. Transition state inhibitors block sEH and stabilize the anti-inflammatory and analgesic epoxides while decreasing inflammatory diols. These sEH inhibitors transcriptionally down regulate cyclooxygenase II and other inflammatory mediators. They dramatically reduce inflammatory pain but surprisingly are more potent reducing diabetic neuropathic pain than gabapentin. They dramatically synergize with COXIBs, PDE inhibitors and other compounds indicating promise for clinical development.

AGFD 63 Metabolism of methoprene: Primary metabolites and natural products David A. Schooley, schooley@unr.edu.; Gary B. Quistad Dept. of Biochemistry, Univ. of Nevada, Reno NV Metabolism Group, PTRL West, Inc., Hercules CA Metabolism

studies of the insecticide methoprene (isopropyl (2E,4E)-11 methoxy -3,7,11-trimethyl-2,4-dodecadienoate) are described. This sesquiterpenoid was studied exhaustively to meet EPA registration requirements. Several unremarkable primary metabolites were identified from [5-14C]methoprene resulting from hydrolysis of the ester and O-demethylation of the 11-methoxyl, which are typical xenobiotic transformations. However, studies were complicated because the carbon skeleton is degraded like dietary isoprenoids, such as phytanic acid. Carbon-14 incorporated efficiently into natural products biosynthesized from acetate, and likely oxaloacetate. In bovines, methoprene incorporated efficiently into cholesterol and its esters, as well as fatty acids. Combined with its extremely low toxicity in animals, these results are consistent with its being treated metabolically more as a natural product than a xenobiotic. These results were also crucial in giving EPA the confidence to eventually grant methoprene an exemption from the requirement of a food tolerance.

AGFD 64 Discovery and applications of (S)-methoprene and related commercially useful juvenile hormone analogs, and applications of some insect sex pheromones and kairomones for enhanced insect control with low environmental impact Clive A. Henrick, cliveah@mindspring.com., Trece Inc, Palo Alto CA A brief overview will be presented of the discovery and development of (S)-methoprene, (S)-hydroprene and (S)-kinoprene. These juvenile hormone analogs are extraordinarily safe for humans and almost all non-target organisms and have minimal impact on the environment. Also the founding of Zoecon Corporation and Trece Inc. will be described, along with the use of some insect sex pheromones and kairomones for selective insect monitoring and control. Other highlights of my 45 years in Agrochemicals will be discussed.

AGFD 65 Chemistry underlying the differences between cheese varieties Michael H. Tunick, michael.tunick@ars.usda.gov, Dairy & Functional Foods Research Unit, Eastern Regional Res. Ctr., USDA-ARS, Wyndmoor PA Americans consume 14 kg of cheese per capita without realizing the extent to which chemistry is responsible for the production of this food. Enzymes from starter culture microorganisms and the coagulant degrade protein (primarily casein), carbohydrates (mostly lactose), and lipids, generating the flavors and texture of cheese. Electrophoresis, electron microscopy, and rheology show that proteolysis, structural development, and functional properties depend on a number of factors, including species of animal producing the milk, processing conditions, and storage temperature and time. Goats' milk, for example, contains significantly less α 1-casein, the primary structural protein in cows' milk cheese, resulting in a soft, easily fractured product. The types of starter and coagulant are responsible for development of different flavors, and the treatment of the cheese curd leads to variations in texture and melting properties. The characteristics of cheese depend on the chemistry involved in the way it is made and stored, and knowledge of this chemistry leads to the creation of a better product.

AGFD 66 Discovery of a new generation of highly potent bitterness blockers Ioana M. Ungureanu, ioana.ungureanu@givaudan.com, Amy H. Yap; Sarah Machover; David Bom; Eric Kohlen; Andrew T Daniher; Phil A. Christenson; Jay P. Slack; Amy Odley; Karen A. Bell Esther van Ommeren; Kim Gray; Liliana Ostopovici-Halip Cristian G. Bologa Tudor I. Oprea; Jenifer Augelli S&T, Givaudan Flavors, Cincinnati OH 45216, US Chemistry Dept., Romanian Academy of Science, Timisoara Timis Romania Univ. of New Mexico School of Medicine, Dept. of Biochemistry, Albuquerque NM We have recently reported the discovery of GIV3727, the first commercially successful bitterness blocker, identified using receptor-based technologies. Recently, a new family of bitterness blockers with higher potency was discovered using HTS. Initial hits, although very potent in vitro and in vivo lacked commercial appeal due to low solubility. Optimization studies allowed us to identify GIV3616 as a commercial candidate, combining not only an optimal organoleptic profile but also drastically improved solubility. This compound was found to reduce bitterness elicited by various sweeteners as well as a wide variety of off-notes, leading to large array of application opportunities in beverage, food, nutraceutical and pharmaceutical applications.

AGFD 67 Hyperspectral image analysis of mango fruits during storage Yoshio Makino, amakino@mail.ecc.u-tokyo.ac.jp, Japan ; Aiko Isami; Yoshinori Kawagoe Seiichi Oshita; Sin-ichiro Kuroki; Aris Yohanes Purwanto Usman Ahmad Mardjan Suro Sutrisno ; Nobuyuki Yasukawa; Rui Ishiyama; Masato Tsukada; Masahiro Serizawa Graduate School of Agricultural and Life Sciences, The Univ. of Tokyo, Japan Graduate School of Agricultural Science, Kobe Univ.,Japan Faculty of Agricultural Technology, Bogor Agricultural Univ., Bogor Indonesia NEC Corporation, Kawasaki Japan Non-destructive analysis of the quality of mango fruits using hyperspectral imaging during storage was attempted in the current study. A hyperspectral camera system composed of 12-bit CCD camera, spectrometer, Xe-halogen light source, sample stage and data logger was used for measuring two-dimensional spectral reflectance in the range of 380 to 1000 nm from the fruits. Reflectance values at 645 and 663 nm at the green areas were higher than those at the yellow and red areas, and were increased with time. It has been reported that chlorophyll absorbed light at 645 and 663 nm. This suggests that the chlorophyll concentration on the surface of mango fruits may affect reflectance of visible light. On the other hand, reflectance at 958 nm tended to increase during storage. This may be associated with the reduction of moisture. We estimated that hyperspectral imaging was effective for evaluating the majority of quality mango fruits during storage.

AGFD 68 Flavor chemistry of the "Bloody Mary" cocktail Neil C. Da Costa, neil.dacosta@iff.com, Research & Development, International Flavors & Fragrances, Inc., Union Beach New Jersey The Bloody Mary is one of the most popularly enjoyed cocktails of all time. It is rumored to have been invented in an American ex-patriot bar in 1930's Paris. Originally called the Red Snapper its name was more popularly changed to one associated with Queen Mary I of England whose reign was considered bloody for its persecution of religious opponents. It is essentially made from tomato juice, vodka and lemon juice, plus several important spices and mixers. These include Worcestershire sauce, Tabasco® sauce, horseradish, black pepper, celery salt. Shaken with ice and strained into a highball glass the cocktail is often garnished with celery and a lemon wedge. Most of these ingredients have been analyzed for their key flavor volatiles and non-volatiles which when combined give a unique flavor. Each of the main ingredients has been shown to contain many flavor components, thus indicating that a Bloody Mary cocktail flavor is a very complex blend of several hundred flavor compounds. These include semi- and non-volatile ingredients with chemesthetic effects such a heat, burn, sour, salty and umami. This presentation will review the composition of these ingredients highlighting the key components and their sensory attributes.

AGFD 69 Synthesis and characterization of sulfide modified vegetable oils Grigor B Bantchev

Grigor.Bantchev@ARS.USDA.gov; Girma Biresaw; James A Kenar Nat'l Ctr. for Agricultural Utilization Research, USDA- Agricultural Research Services, Peoria IL Butanethiol was used in ultraviolet-initiated thiol-ene reaction with canola and corn oils to produce sulfide-modified vegetable oils (SMVO). The crude SMVO product was successfully purified by solvent extraction, vacuum evaporation, and silica gel chromatography. The SMVO products were characterized by NMR and FTIR. Further product characterization and analysis was conducted using GC and GC-MS on the fatty acid methyl esters obtained by the transesterification of the SMVO products. Investigation of the effect of reaction conditions showed that high yield and high conversion of double bonds into thiol were favored at low reaction temperatures and high butanethiol/vegetable oil ratios. Canola and corn oils gave similar double-bond conversions and yields of the desired SMVO product. The SMVO products were tested as lubricants. They showed improved low-temperature properties and acted as antioxidant additives. The friction and anti-wear properties were essentially the same as the ones of the starting vegetable oils.

AGFD 70 Bioactive components of Carica papaya seed oil Israel Sunmola Afolabi, afolabisunmola@yahoo.com, Veronica

Olubusayo Adade Dept. of Biological Sciences, Biochemistry Unit, Covenant Univ., College of Science and Technology,, Canaan Land/Ota Ogun State Nigeria Carica papaya Linn belongs to the Caricaceae family. The seeds have been undervalued and are currently disposed off as waste. This project was carried out by determining the fatty acids, and bioactive component of its oil using a Gas Chromatography-Mass spectrophotometer so as to unravel the potential usefulness of the seed. The seeds were dried at $50 \pm 30^\circ\text{C}$ for a period of 20 hours, and the oil was extracted with a Soxhlet apparatus using n-hexane as solvent. Twenty five compounds were identified in the oil. The results showed that the oil contain palmitic (0.253mg/ml), and linoleic acids derivatives (0.165mg/ml). Benzyl isothiocyanate (11.84mg/ml), oleyl alcohol (0.445mg/ml), β -sitosterol (0.879 mg/ml), xylene (1.00mg/ml) were some of the resourceful bioactive component identified. Hence, the seeds should no longer be wasted as the fatty acids and other bioactive constituents is an indication of the health beneficial impart of the oil when administered within appropriate intake. These bioactive compounds could be attributed to the medicinal, antimicrobial activities, and potential industrial application of Carica papaya seed. The oil may not be recommended for culinary purposes but may be administered in small dosage for medicinal purposes to prevent any detrimental effect.

AGFD 71 Characterization of amaranth-like lunasin: A novel cancer-preventive peptide Ana P Barba de la Rosa

apbarba@ipicyt.edu.mx; Enrique Maldonado Cervantes; Hyung Jin Jeong; María F León-Galván; Alberto Barrera-Pacheco; Antonio De León-Rodríguez; Elvira González de Mejía; Benito O de Lumen Molecular Biology, Institute for Scientific and Technological Research at San Luis Potosi, San Luis Potosi San Luis Potosi Mexico School of Bioresources, Andong National Univ., Korea, Kyungpook Korea, Republic of Korea Food Science and Human Nutrition, Univ. of Illinois, Urbana-Champaign Illinois Nutritional Sciences and Toxicology, Univ. of California, Berkeley CA Because an unbalanced diet is an important risk factor for several illnesses, interest has increased in finding novel health-promoting foods. Amaranth produces seeds that not only have substantial nutritional properties but also contain phytochemical compounds as rutin and nicotiflorin, but also peptides with different biological activities. The peptide with a cancer-preventive properties from amaranth was isolated and characterized. The peptide has a MW of aprox 20 kD and has activities similar to those reported for soybean lunasin. However, the amaranth lunasin-like peptide, requires less time than the soybean lunasin to internalize in the nucleus of NIH-3T3 cells, also inhibits the histone acetylation (H3 and H4 in a 70 and 77%, respectively). The amaranth lunasin-like peptide inhibited the transformation of NIH-3T3 cells to cancerous foci. Amaranth is a food alternative containing natural peptides with health-promoting benefits. Acknowledgments: We thanks to UC-Mexus support

AGFD 72 Phytochemical composition and antioxidant capacity of low-linolenic soybeans Monica Whent,

mwhent@umd.edu, Junjie Hao Margaret Slavin; Liangli Yu Dept. of Nutrition and Food Science, Univ. of Maryland, College Park, Dept. of Mathematics, Univ. of Maryland, College Park, Seven experimental soybean lines low in a-linolenic acid (18:3, n-3) and one non-modified genotype were analyzed for total phenolic content (TPC), antioxidant capacity, isoflavone composition, lutein, tocopherols, and fatty acid composition. Samples were taken from 3 growing environments, and effects of genotype and growing environment on phytochemical composition were examined. Total isoflavones ranged from 0.40 to 0.70 $\mu\text{mol/g}$ whole bean. Lutein content ranged from 11.1 to 24.1 $\mu\text{g/g}$ oil. Total tocopherols ranged from 2.5 to 2.9 $\mu\text{mol/g}$ oil. There was a significant effect of interaction between genotype and environment on TPC, antioxidant capacity, total isoflavones, lutein, tocopherols, and fatty acids ($P < 0.05$). The results show that these experimental low a-linolenic acid soybeans contain similar levels of specific phytochemicals compared with non-modified soybeans. It also demonstrates that the health-enhancing properties of these modified soybean lines are influenced by genotype, environment, and their interactions.

AGFD 73 Rapid determination of catechins in green tea Pranathi R Perati pranathi.perati@dionex.com, Brian De Borba;

Jeffrey S Rohrer Applications Marketing, Dionex Corp., Sunnyvale Ca Catechins are powerful antioxidants found in green tea that are considered to provide several human health benefits. Studies have shown that green tea can reduce cholesterol and obesity, and provide protection against cardiovascular disease and cancer. Due to its reported health benefits and high polyphenol content, green tea is gaining rapid popularity and is currently one of the most consumed non-alcoholic drinks worldwide. This paper describes a sensitive, fast, and accurate HPLC method to determine catechins in green tea, which include catechin, epicatechin, epigallocatechin, epicatechin gallate, gallic catechin, gallic catechin gallate, and epigallocatechin gallate. The method uses a high-resolution silica-based 2.2 μm , Acclaim C18 RSLC column and a wavelength of 210 nm to separate and detect catechins. The method demonstrates good sensitivity, enabling the detection of a wide range of catechins found in green tea. The linearity, LOD, LOQ, and accuracy of the method to determine catechins will be reported.

AGFD 74 Systematic study of the polyphenol: Composition of extracts of Hibiscus sabdariffa Heba Abbas Sindi

fshs@leeds.ac.uk; Mike Morgan , M.Morgan@food.leeds.ac.uk, Univ. of Leeds, Dept. of food science and nutrition, Leeds West Yorkshire UK ; Lisa Lang, l.j.lang@leeds.ac.uk, Univ. of Leeds, School of food science and nutrition, Leeds West yorkshire United Kingdom . Dept. of Food Science and Nutrition, Univ. of Leeds, Leeds West Yorkshire United Kingdom Extracts of Hibiscus sabdariffa have recently been associated with significant hypotensive bioactivity, being shown in particular to reduce blood pressure. Though there have been a number

of studies of bioactivity of extracts of *H. Sabdariffa* (including the use of water, methanol, acetone and ethyl acetate as solvents) there has been little consistent or systematic study into the compounds responsible for bioactivity, which are believed to be polyphenolic in nature. Therefore, we have systematically characterised the composition of extracts, made with different solvents, of dried flowers from *H. sabdariffa*. The antioxidant capacity of *H. sabdariffa* extracts was analysed by DPPH, TEAC and FRAP methods. Total polyphenols were determined using the Folin method. Reverse-phase (HPLC) was used in order to identify and quantify the anthocyanins (including delphinidin and cyanidin) in the different extracts. *H. sabdariffa* may be an important source of dietary bioactive compounds protective against chronic disease.

AGFD 75 Determination of polymethoxyflavones and monodemethylated polymethoxyflavones in citrus fruits and their tyrosinase inhibition ability Chih-Yu Lo, chihyulo@mail.ncyu.edu.tw, Yu-Shan Lin; Shiming Li; Min-Shiung Pan; Chi-Tang Ho Dept. of Food Science, National Chiayi Univ., Chiayi City Taiwan Republic of China Dept. of Food Science, Rutgers Univ., NJ Dept. of Seafood Science, National Kaohsiung Marine Univ., Kaohsiung Taiwan Republic of China Polymethoxylated flavones (PMF) are found in citrus fruits. In this study, not only six PMFs but also two major monodemethylated PMFs were quantified from the citrus dry peels. Tyrosinase, a copper-containing monophenol monooxygenase, is ubiquitously existed among plants, animals and microorganisms. It catalyzes the oxidation of tyrosine and subsequent auto-oxidation reactions which are responsible for the formation of mammalian melanin pigments. The use of tyrosinase inhibitors is a desirable approach to suppress unwanted hyperpigmentation in human skin or enzymatic browning in fruits. We surveyed tyrosinase inhibitors on the key polymethoxyflavone components in citrus peel extracts. Among the tested compounds, the anti-tyrosinase activity of nobiletin (IC₅₀ = 92 μM) and tangeritin (IC₅₀ = 131 μM) were higher than kojic acid (IC₅₀ = 221 μM). Kojic acid is widely used as a mild inhibitor of the pigment formation in plant and animal tissues. The quartz crystal microbalance (QCM) was further explored to monitor the degree of binding among tyrosinase and citrus polymethoxyflavones in real time.

AGFD 76 Purification and characterization of α-L-rhamnosidase from *Aspergillus niger* Hui Ni, nihui1973@yahoo.com.cn; Feng Chen; Huinong Cai Jimei Univ., China Clemson Univ., US α-L-rhamnosidase (Rha) was purified to homogeneity from naringinase, which was prepared and extracted from a fermented broth of *Aspergillus niger*. The enzyme was purified by ammonium sulphate fractionation and chromatographies on DEAE Sepharose, Sephacryl S-200 HR, and using naringin as a specific substrate to detect the enzymatic activity by a novel HPLC method. The purified Rha was determined to have a molecular weight of approximately 87 kDa by the exclusive gel chromatography and SDS-PAGE analyses. Its optimal pH and stable pH values were within the range of 4.5-5 and 3.5-7.5, respectively, while its optimal temperature was in 50-60 °C. In addition, the enzyme was strongly inhibited by Fe²⁺, Fe³⁺, Zn²⁺, Al³⁺, Mn²⁺, Cu²⁺, Ag⁺, Hg²⁺ ions and SDS, and slightly activated by K⁺ and Ba²⁺ ions. This Rha was more specifically affiliated to rutin and naringin than p-nitrophenyl-α-L-rhamnopyranoside. Its K_m towards naringin was 0.27 mM with a V_{max} at 16.89 U/mg. All the combined information indicated that this enzyme was the α-L-rhamnosidase from naringinase.

AGFD 77 Investigation of antioxidant properties of a local spice (*Monodora myristica*) extract Mark Azih, markazih@yahoo.com, Dept. of Chemistry, Ambrose Alli Univ., Ekpoma Edo State, Nigeria Lipid oxidation in palm, palm kernel and groundnut oils was monitored through iodine value (IV) and peroxide value (PV) measurements. Each oil was divided into three samples; sample A was the control, to sample B was added BHA, and to sample C was added the spice (*Monodora myristica*) ethanol extract. Each sample was heated at 150°C and the IV and PV were determined after 0, 1, 2, 4, 8 and 16 hours of heating. A progressive decrease in IV was observed in palm oil from 53.6 to 49.8, 52.4 and 51.7 respectively for samples A, B and C after 16hrs. The results for palm kernel and groundnut oils showed a similar pattern. The PV results for palm oil increased from 5.0meq/kg to 8.2, 5.8 and 6.0meq/kg respectively for samples A, B and C over the same period. The results are explained as probable effects of concentration and antioxidant thermal lability.

AGFD 78 Novel inhibitory mechanism of dopachrome formation by thymol Hiroki Satooka, hiro_satooka@berkeley.edu, Isao Kubo Dept. of Nutritional Science & Toxicology, Univ. of California, Berkeley Dept. of Environmental Science, Policy and Management, Univ. of California, Berkeley Novel inhibitory mechanism of thymol, 2-isopropyl-5-methylphenol, on dopachrome formation by mushroom tyrosinase (EC 1.14.18.1) was identified. UV-vis spectrum and oxygen consumption assays showed that dopachrome formation using a L-tyrosine as a substrate was suppressed by thymol. This inhibitory activity was reversed by the addition of a well-known radical scavenger, butylated hydroxyanisole (BHA). Further investigations using N-acetyl-L-tyrosine as a substrate with HPLC analysis suggested that it is possible for thymol to inhibit a chemical redox reaction between dopaquinone and leukodopachrome, but not for enzymes. This redox inhibitory activity of thymol was also examined using L-DOPA redox reaction with benzoquinone as a model system. Thymol successfully inhibited oxidation of L-DOPA to dopaquinone, coupled with reduction of benzoquinone. All of this data supports inhibition of dopachrome formation by thymol which is due to a decrease in the rate of chemical redox reaction (conversion of leukodopachrome to dopachrome) after mushroom tyrosinase produces dopaquinone and leukodopachrome; therefore, overall dopachrome formation is suppressed. The antioxidant property (proton donor) of thymol is a key characteristic for this inhibitory mechanism.

AGFD 79 Rapid determination of anthocyanins in pomegranate juice Pranathi R Perati, pranathi.perati@dionex.com Brian DeBorba; Jeffrey S Rohrer Applications Marketing, Dionex Corporation, Sunnyvale CA Anthocyanins are a subclass of flavonoids that are responsible for the bright colors in fruits and flowers. An increased understanding of their health benefits from the high antioxidant concentrations has led to a growing interest in determining anthocyanins in pomegranate juice (PJ) and related products. However, due to its high demand and short supply, adulteration of PJ has become more widespread. This paper describes a sensitive, fast, and accurate method to determine anthocyanins in commercially available fruit juices and juice blends with a simple dilution. The method uses a high-resolution silica-based 2.2 μm, Acclaim C18 RSLC column and a wavelength of 540 nm to separate and detect the six signature anthocyanins found in PJ in < 5 min. The method demonstrated good sensitivity with LODs from 0.12-0.37 μg/mL. Method accuracy was evaluated for all juices by spiking known amounts of six anthocyanins with good recoveries, suggesting the method was accurate.

AGFD 80 Effect of common salt and red pepper (*Capsicum annuum*) on fatty acid stability in melon (*Citrullus vulgaris* schrad) seed meal oil Mark C. Azih, markazih@yahoo.com, Hanson O. Iyawe Dept. of Chemistry, Ambrose Alli Univ., Ekpoma Edo

State, Nigeria Dept. of Biochemistry, Ambrose Alli Univ., Ekpoma Edo State, Nigeria This study investigated the effects of a local cultivar of *Capsicum annum* and sodium chloride separately and in combination on processed and stored melon seed meal oil. Various concentrations (0.25, 0.50, 0.75 and 1.00 % w/w) of these additives were applied to the oil samples and the peroxide values (PV) were monitored for four weeks. Data obtained from the study indicate significant increases ($P < 0.05$) in the peroxide values of oil treated with sodium chloride, *Capsicum annum* and a combination of both in comparison to their respective control groups. The results obtained do not suggest that the use of these additives as applied in this study holds any promise in the prevention of rancidity in processed melon seed meal oil.

AGFD 81 Screening and mapping of some constituents in potatoes using infrared and Raman spectroscopes Nsoki Phambu, nphambu@tnstate.edu, Dept. of chemistry, Tennessee State Univ., Nashville Tennessee Potato is a cheap and plentiful crop that grows in a wide variety of climates. It is the world's fourth-largest food crop, following rice, wheat, and maize. In terms of nutrition, potato is best known for its carbohydrate content. But it also contains proteins, lipids, minerals, and vitamins. This study investigates the structure of four varieties of potatoes (American sweet, Japanese sweet, white and red potatoes) using infrared and Raman spectroscopes. Infrared and Raman microscopes enable identification of specific constituents using marker bands. FTIR spectra indicate the presence of carboxylic groups in Japanese and American sweet potatoes. Deconvolution of the IR amide I band allowed a correlation between the structure of proteins and the variety of potato. Raman spectra indicate that white potato contains more proteins and lipids than the other varieties. American sweet potato contains less starch than the others. Raman mappings show the distribution of these components

AGFD 82 Accelerated extraction of phenolic components from reduced volume barrels by whiskey spirits John D.E. Jeffery, jeffery9@msu.edu; Kris A. Berglund Food Science and Human Nutrition, Michigan State Univ., East Lansing Michigan In the maturation of aged distilled spirits the period of barrel aging is of paramount importance. It is common practice in industry to conduct this aging in 55 gallon barrels, and much data has been collected on various aspects of the extractions and reactions taking place during this time. A smaller artisan industry has begun to grow which utilizes smaller sized barrels for accelerated extraction of phenolic components. While it is known in industry that spirits aged in this way reach full extraction more quickly and therefore reach maturity in less time, no work has quantified the rate of extraction of specific components in alternative sized barrels. It is the objective of this study to utilize gas chromatography-mass spectrometry to quantify extraction of 7 phenolic components from 2,3,5 and 10 gallon barrels over a 6-8 month period. guaiacol, 2-methoxy-4-methylphenol, eugenol, isoeugenol, vanillin, acetovanillone, and syringaldehyde have been linked in previous work to complete oak extraction and these lignin derived compounds will be analyzed on a biweekly basis to determine relative rates of extraction. The final objective is to assess extraction as a function of internal surface area to yield data useful to industry in the determination of aging time.

AGFD 83 GC-MS determination of bisphenol A analogs in shrimp and lobster samples Yuegang Zuo, yzuo@umassd.edu; Zhuo Zhu; Zhao Luo; Yiwei Deng; James D Stuart Dept. of Chemistry and Biochemistry, Univ. of Massachusetts Dartmouth, North Dartmouth MA Dept. of Natural Sciences, Univ. of Michigan Dearborn, MI Dept. of Chemistry, Univ. of Connecticut, Storrs Bisphenol A is widely used in plastic and other industrial consumer products. Release of bisphenol A and its analogues into the aquatic environment during manufacture, use and disposal has been a great scientific and public concern due to their toxicity and endocrine disrupting effect on aquatic wildlife and even human beings. More recent studies have shown that these alkylphenols may affect the molting processes and survival of crustacean species such as American lobster and shrimps. In this study, we have developed GC-FID and GC-MS methods for the determination of bisphenol A and its analogues in shrimp and lobster samples. Bisphenol A, 2,4-bis-(dimethylbenzyl)phenol and 4-cumylphenol were found in shrimp *Macrobrachium rosenbergii* in the concentration range of 0.67–5.51, 0.36–1.61, and 1.96 $\mu\text{g/g}$ (wet weight), respectively. In lobster tissue samples, bisphenol A, 2-t-butyl-4-(dimethylbenzyl)phenol, 2,6-bis-(t-butyl)-4-(dimethylbenzyl)phenol, 2,4-bis-dimethylbenzylphenol, 2,4-bis-(dimethylbenzyl)-6-t-butylphenol and 4-cumylphenol were determined at the concentration range of 4.48-29.2, 0.90-4.62, 2.71-28.1, 0.35-3.66, 0.64-4.76, and 0.44-5.94 $\mu\text{g/g}$ (wet weight), respectively. The effects of these endocrine disrupting alkylphenols on the molting of shellfishes will be reported at the presentation.

AGFD 84 Can acrylamide be mitigated throughout the industrial production process of French fries? Raquel Medeiros Vinci, raquel.vinci@ugent.be; Frédéric Mestdagh; Christof Van Poucke; Carlos Van Peteghem Bruno De Meulenaer Dept. of Food Safety and Food Quality, Ghent Univ., Faculty of Bioscience Engineering, Ghent Belgium Dept. of Bioanalysis, Ghent Univ., Faculty of Pharmaceutical Sciences, Ghent Belgium The probable human carcinogen acrylamide, is produced in various food products. French fries contain the main precursors necessary for acrylamide formation and moreover they contribute on average for an important part of the dietary exposure to this process contaminant. Various mitigation strategies to lower the susceptibility of potato tubers to form acrylamide during frying have been proposed. Mostly these strategies have been studied on lab scale, however their evaluation on an industrial scale was still lacking. This paper evaluated two types of mitigation strategies on industrial level. Minor changes in the current quality controls for the raw potato tuber would allow a much better identification of acrylamide sensitive potatoes. Secondly industrial pre-treatments of the potatoes with various additives were evaluated on industrial scale, based on their acrylamide mitigation potential and other quality parameters. This study showed that 'lab scale studies' in acrylamide mitigation research should be interpreted with utmost care. Acknowledgements Financial support by Flanders' FOOD, EPPA and Belgapom is gratefully acknowledged.

AGFD 85 Food scientists: A call to action Dondeena G. Bradley, dondeena.bradley@pepsico.com, Dept. of Nutrition, Global PepsiCo, Purchase NY Food science is a fundamentally important discipline used to help experts develop integrative solutions for many issues related to global nutrition and overall health. CDC data shows that, between the 1970s and the 2000s, obesity and overweight amongst the US population has tripled. In 2010, about 1 in 3 Americans aged 20+ (estimated 76.4 million) are obese. Obesity is costly to the healthcare system and to those individuals who live with the everyday challenges of being overweight. In addition, while one billion people in the world are overweight or obese, the same number of people are undernourished or underweight. We simply cannot work to resolve one while ignoring the other. Food scientists can advance technology to develop more innovative food and beverage products that take into account the entire food system in order to contribute to healthier eating and drinking. This requires rethinking how to increase the

amount of whole grains, fruits, vegetables, nuts, seeds and low-fat dairy that is accessible and affordable for diverse cultures around the world. This task is incredibly complex, yet almost overly simplistic in principle. More collaborative innovation in food science, nutrition and other disciplines is critical to make a real, measurable difference - one which we at PepsiCo are working hard towards every day

AGFD 86 Past, present, and future: Contributions of women to the agricultural sciences Catherine Woteki, aemitchell@ucdavis.edu, Dr. Catherine Woteki is the new Undersecretary for Research, Education, and Economics (REE) at the USDA (USDA). In her new position, Dr. Woteki will oversee the National Institute of Food and Agriculture and its Agriculture and Food Research Initiative, as well as other USDA agencies including the Agricultural Research Service, the Economic Research Service, and the National Agricultural Statistics Service. Dr. Woteki has held many distinguished positions including Global Director for Scientific Affairs at Mars, Incorporated, Undersecretary for Food Safety and the Deputy Undersecretary for REE during the Clinton Administration. From 2002 to 2005, she was Dean of Agriculture and Professor of Human Nutrition at Iowa State Univ..

AGFD 87 Innovative food processing for health Tara McHugh, tara.mchugh@ars.usda.gov, Processed Foods Research Unit, USDA-ARS-WRRC, Albany CA Innovative food processing can be used to increase utilization and consumption of specialty crops and their co-products in value-added forms, while improving sustainability of agricultural and food processing operations and enhancing overall nutritional quality and safety of foods for both domestic and international consumers. This presentation will review various innovative food processes that have been developed at the USDA, Agricultural Research Service, Western Regional Res. Ctr. in Albany, CA and transferred into commercialization through partnerships with industry. Technologies resulting in novel food products such as 100% fruit bars, fruit and vegetable edible wraps and vitamin D enhanced mushrooms will be discussed. Future food processing opportunities using infrared and ultraviolet treatments will also be presented.

AGFD 88 Perspectives on flavor research Ann C. Noble, acnoble@ucdavis.edu, Dept. of Viticulture and Enology, Univ. of California, Davis CA Flavor chemistry has advanced as new methods have been developed for analyzing trace compounds. At first, "trace" levels meant mg quantities; now detection and identification of ng and pg levels is routine. Along with this advancement chemists began to recognize the need to use sensory tests to evaluate the significance of the volatile data. Concurrently, sensory methods were being developed by psychologists to measure how we respond to stimuli. As well "Sensory Evaluation" methodology was developed to measure the sensory properties of foods. We have advanced from clipping Moths to exit ports of GCs to using sophisticated multivariate statistical analyses to relate volatile composition, GC-Olfactometry and analytical sensory profiles. Where do we go from here?

AGFD 89 Environmental stress, wild berry fruits, and human health benefits Mary Ann Lila, mlila@ncsu.edu Dept. of Food Bioprocessing and Nutrition Sciences, North Carolina State Univ., Kannapolis North Carolina It is a common cliché to claim that 'stress' can strengthen our human character and resilience. In the same way, stress can exert enormous influence on the chemical composition of plants, including berry fruits. The link between environmental or climatic stressors (elicitors) and deposition of health-protective secondary phytochemicals in plants is well established, and in the arctic tundra of Alaska, or the exposed plains of the Dakotas, these stresses are taken to extreme limits. Surrounding many of the Alaska Native communities north of the Arctic Circle, wild berries are the only terrestrial wild edible plants which thrive in the harsh environment, and similarly in the Dakotas, these underappreciated species still are integral to the traditional diets. In recent years, as native communities have shifted towards more Western diets and away from traditions, the incidence of diabetes and obesity has skyrocketed. Using a hands-on, field-deployable Screens-to-Nature (S2N) approach, we have partnered with elders and youth from three geographically distinct Alaskan villages, and 5 tribes in the Dakotas, to assess the health protective (and in particular, anti-diabetic) properties of local berries. Accumulation of bioactive flavonoid compounds (including proanthocyanidins and anthocyanin pigments) within a berry species varied according to geographic location. Berry extracts proved capable of inhibiting adipogenesis, and in particular, proanthocyanidin-rich fractions reduced lipid accumulation in 3T3-L1 adipocytes. The complex phytochemical composition of these berries was able to modulate specific cellular targets relating to metabolic syndrome and obesity. Research supported by EPA STAR Research Grant No. EPA RD-83370701 and USDA Tribal Colleges Grant.

AGFD 90 Development of new rice cultivars for conventional and value-added markets Anna McClung, anna.mcclung@ars.usda.gov Robert Fjellstrom; William D. Park; Christine Bergman; Susan McCouch Dale Bumpers National Rice Res. Ctr., USDA ARS, Stuttgart AR Dept. of Biochemistry, Texas A&M Univ., College Station Univ. of Nevada, Las Vegas Cornell Univ., Ithaca NY, Rice is a staple food crop for half of the world's population. The US supplies about 10% of the rice that is the world market. US rice production is located in the mid-south and California, with half of the country's production located in Arkansas. Domestic rice consumption in the US has increased due to rice being promoted a healthy whole grain, its use in many convenience food products, and interest in specialty markets like the aromatic basmati and jasmine rices. Using conventional breeding methods takes about 10 years to develop new rice variety. We have developed genetic markers that are linked to major genes controlling disease resistance and rice cooking, processing, and sensory quality. These markers have been used to shorten the breeding cycle by three to five years, and facilitate stacking genes in new cultivars in novel ways. This has resulted in the development of rice cultivars with improved disease resistance and requires less fungicide use. In addition, we have developed rice cultivars that have novel starch properties in the grain which are being used by parboiling and canning industries. These rice cultivars have less starch solids loss and better grain integrity after undergoing industrial processing. In collaboration with an industry partner we developed a rice variety that has novel grain chemistry properties that, when processed, produces a quick cooking brown rice, thus combining whole grain health benefits with convenient cooking. More recently, efforts have been made to expand the gene pool available in US rice breeding. We have incorporated chromosomal segments from a wild weedy species of rice that has improved yield over the original parent cultivar by 20%. Use of genomic technology is allowing us to increase breeding efficiency and identify novel genes that will increase crop value and adaptation to biotic and abiotic stresses.

AGFD 91 Biofortification in Brazil: A sustainable way to improve nutrition and health Marilia Regini Nutti, marilia@ctaa.embrapa.br, Embrapa Food Technology, Embrapa Food Technology, Brasilia Brazil, Most efforts to combat micronutrient deficiency in the developing world focus on providing vitamin and mineral supplements to the poor and on fortifying foods

with these nutrients through postharvest processing. The introduction of biofortified crops – varieties bred for increased mineral and vitamin content – could complement existing nutrition interventions and provide a sustainable, low-cost way of combating malnutrition. Research and development of biofortified foods in Brazil highlight a unique aspect that makes Brazil different from other countries - Brazil is the only country where eight different crops are studied at the same time, namely, pumpkin, rice, sweet potatoes, beans, cowpeas, cassava, maize, and wheat. The project aims to fortify foods that are already part of the diet of the population providing access to more nutritious products without requiring any changes in their consumption habits. In the field, cultivars are selected and the most promising ones move on to the breeding stage. At this stage, the objective is to attain more nutritious cultivars that also have good agronomic qualities (yield, resistance to drought and pests and diseases), besides good market acceptance.

AGFD 92 From Montreal to Zurich, Ottawa and finally to California almonds Karen Lapsley

klapsley@almondboard.com, Almond Board of California, US How do three food science degrees with a mix of engineering/chemistry and nutrition take someone from Montreal, to Zurich, back to Ottawa and finally to central valley California over a 25 year journey? Dr. Karen Lapsley's career path has spanned academia, government and the food industry. Karen will elaborate on the decisions she has made that resulted in her managing the California almond industry's contracted out research programs at over 20 Res. Ctr.s and universities worldwide since 1999. California produces 80 percent of the almonds globally and exports over 70 percent of the crop and its products. Dr. Lapsley will describe how she focuses on a balance of North American and international research collaborations to explore the linkages on the continuum from bee health to human health. She liaises with PR agencies globally, represents ABC on scientific issues and at the International Tree Nut Council, which has ongoing contact with WHO. Dr. Lapsley was VP of the Functional Foods Division, Ceapro Inc., (1996-1999) a Canadian start-up company developing oat-based ingredients, including a solid test meal for diabetes screening. With Agriculture & Agri-Food Canada 1983-1996, she was most recently in charge of the Food Research Program in Ottawa (5 research programs, 90 staff). When she's not thinking about almonds and/or she enjoys sailing/scuba diving with her husband and/or relaxing at home.

AGFD 93 Integrated rate expression for carbon dioxide assimilation in green plants Sambhu N. Datta,

sndatta@chem.iitb.ac.in, Dept. of Chemistry, Indian Institute of Technology - Bombay, Powai, MUMBAI, India Dept. of Chemistry, J. K. College Purulia, Purulia West Bengal, India We present a kinetic formulation for the overall process of photosynthesis in green plants. A comprehensive scheme involving light and dark reactions was constructed for C4 plants. Theoretical and numerical investigations of exciton-phonon dynamics in thylakoid yielded the exciton trapping rate at photosystems, and the NADPH formation rate, R_1' . Photochemical efficiency F was derived in terms of membrane survival probability and CO₂ saturation probability in bundle sheath. Considering rates of different interrelated steps, and the dependence of rubisco activation on pressure, we derived the glucose-equivalent production rate in terms of the lumen volume v_L , the enzyme activation quotient $g(T,p)$, and the concentration reaction quotient Q : $R_{\text{glucose}} = (8/3)R_1'v_L F(T,p)g(T,p)([G3P]/[Pi]_{2\text{leaf}})_{ss} Q_{G3P}^{\text{glucose}}$ The validity of the temperature-dependent expression for ACO₂ ($=6R_{\text{glucose}}$) was demonstrated using five different C4 plants. The temperature and pressure-dependent rate expression was validated using two more C4 plants, *Panicum antidotale* and *Panicum coloratum*. For C3 plants, rubisco acts both as oxygenase and carboxylase, and ACO₂ also depends on $p(\text{CO}_2)$. These and other critical issues will be discussed.

AGFD 94 SYP-11277: A novel strobilurin containing phenylaminopyrimidine acaricide Baoshan Chai,

chaibaoshan@sinochem.com, Changling Liu, liuchangling@sinochem.com, Shenyang Liaoning, China; Huichao Li; Shaowu Liu; Yuquan Song; Junbiao Chang Dept. of Agrochemical Discovery, State Key Laboratory of the Discovery and Development of Novel Pesticide, Shenyang Research Inst. of Chemical Industry Co., Ltd., Shenyang Liaoning Dept of Chemistry, Zhengzhou Univ., Shenyang Liaoning China (E)-methyl 2-(2-((2-(2,4-dichlorophenylamino)-6-(trifluoromethyl)pyrimidin-4-yl)oxy)methyl)phenyl)-3-methoxyacrylate, is a novel strobilurin containing phenylaminopyrimidine acaricide, and provides potent active against phytophagous mites both in greenhouse and field trials. It shows excellent efficacy against all developmental stages of mites. It is extremely effective against Tetranychus and Panonychus mites, while quite safe to other non-target organisms. Field trials of 5% soluble concentrate (SL) formulation of SYP-11277 indicate that it is effective against spider mites at 25-100 g a.i./ha with sufficient persistence on fruit trees. No phytotoxicity has been observed on citrus and apple trees. SYP-11277 is low toxicity to mammal and selected as a promising compound to be developed as a new acaricide.

AGFD 95 Microwave-induced esterification of chlorogenic acid and other polyphenolic acids catalyzed by Hafnium

(IV) chloride Bishambar Dayal dayalbi@umdnj.edu, Vineela Reddy Yannamreddy; lekha Racharla Michael Lea; Jasmine Desai Medicine, UMDNJ-New Jersey Medical School, Newark NJ Health Informatics, UMDNJ-School of Health Related Professions, Newark NJ Rutgers University, Piscataway New Jersey Biochemistry and Molecular Biology, UMDNJ-New Jersey Medical School, Newark NJ UMDNJ-Graduate School of Biomedical Sciences, Stratford NJ A recent report by Mazon and coworkers (J. Macromolecular Science 2010) described the Hafnium (IV) Chloride catalyzed polycondensation of a,w-alkanediol with dicarboxylic acids. Their results demonstrated that Hafnium Tetrachloride was not the exceptionally good catalyst for polyester synthesis as suggested by Ishihara and his colleagues (Science 2000). This prompted us to study this reaction in our laboratory with chlorogenic and other related polyphenolic acids. Chlorogenic acid present in coffee and in black tea has been suggested to raise total homocysteine, a cardiovascular biomarker concentration in plasma. In order to quantitate the concentration of chlorogenic acid and its metabolites in biological samples, caffeic acid and quinic acid we have developed a simplified procedure to esterify chlorogenic acid and its closely related polyphenolic acids with Hafnium Tetrachloride Tetrahydrofuran (HfCl₄.2(THF) complex in methanol solvent. Chlorogenic acid, gallic acid, caffeic acid and ellagic acid were converted into their corresponding methyl esters in almost quantitative yield in 50-60 seconds in the domestic microwave oven. Esterification with HCl/ Methanol reagent resulted in cleavage of the chlorogenic acid molecule yielding caffeic acid and quinic acid. Chlorogenic acids and their corresponding methyl esters were very well resolved by analytical and preparatory TLC. Since the Hafnium Tetrachloride THF Complex is stable and solid at room temperature it is easier to work with than HCl/Methanol. We believe that we have found a highly satisfactory esterifying reagent for the quantification of different forms of polyphenolic acids in plants and vegetables.

AGFD 96 Design, synthesis and structure-activity relationship of novel dichloro-allyloxy-phenol derivatives containing substituted pyrazoles Miao Li, limiao@sinochem.com, Changling Liu, liuchangling@vip.163.com, Shenyang Liaoning, China ; Jing Zhang Qiao Wu; Yuquan Song Dept. of Agrochemical Discovery, State Key Laboratory of the Discovery and Development of Novel Pesticide, Shenyang Research Institute of Chemical Industry Co., Ltd., Shenyang Liaoning, China A new class of insecticide Pyridalyl has very good control efficacy against various lepidopterous and thysanopterous pests on cotton and vegetables. To discover new insecticides with high activity, utilizing the intermediate derivatization method a series of new dichloro-allyloxy-phenol derivatives containing substituted pyrazole moieties were synthesized and bioassayed. The compounds were identified by ¹H nuclear magnetic resonance (NMR), IR, MS and elemental analysis. Preliminary bioassays indicated that some compounds exhibited excellent insecticidal activities against the diamondback moth (*Plutella xylostella*) at 6.25 mg L⁻¹. The relationship between structure and biological activity is discussed in terms of effects of the substituent of the pyrazole ring. The present work demonstrates that dichloro-allyloxy-phenol derivatives with substituted phenylpyrazole moieties can be used as possible lead compounds for further developing novel insecticides.

AGFD 97 Inhibitory effect of magnolol on TPA-induced skin inflammation and tumor promotion in mice Min-Hsiung Pan, mhpan@mail.nkmu.edu.tw, Dept. of Seafood Science, National Kaohsiung Marine Univ., Kaohsiung Kaohsiung, Taiwan Republic of China Magnolol has been reported to have an anti-inflammatory and anti-tumor effect in vitro and in vivo. Herein, we report the first investigation of the inhibitory effects of magnolol on 12-O-tetradecanoylphorbol-13-acetate (TPA)-induced expression of inducible nitric oxide synthase (iNOS) and cyclooxygenase-2 (COX-2) in mouse skin. We found that the topical application of magnolol can effectively inhibit the transcriptional activation of iNOS and COX-2 mRNA and protein in mouse skin stimulated by TPA. Pretreatment with magnolol resulted in the reduction of TPA-induced nuclear translocation of nuclear factor- κ B (NF κ B) subunit and DNA binding by blocking phosphorylation of I κ B α and p65 and subsequent degradation of I κ B α . In addition, magnolol can suppress TPA-induced activation of extracellular signal-regulated kinase (ERK)1/2, p38 mitogen-activated protein kinase (MAPK), and phosphatidylinositol 3-kinase (PI3K)/Akt, which are upstream of NF κ B. Moreover, magnolol significantly inhibited 7,12-dimethylbenzo[*a*]anthracene (DMBA)/TPA-induced skin tumor formation by reducing the tumor multiplicity, tumor incidence, and tumor size of papillomas at 20 weeks. Therefore, all these results revealed for the first time that magnolol is an effective antitumor agent and its inhibitory effect is through the down-regulation of inflammatory iNOS and COX-2 gene expression in mouse skin, suggesting that magnolol is a novel functional agent capable of preventing inflammation-associated tumorigenesis.

AGFD 98 Mild oxidation promotes myofibrillar protein gelation and meat hydration: The mode of action Youling L. Xiong, ylxiong@uky.edu, Dept. of Animal and Food Sciences, Univ. of Kentucky, Lexington KY Oxidation is a major factor affecting textural properties of processed muscle foods. Reactive oxygen species (ROS), such as hydroxyl radical and ferryl species, are common initiators of protein oxidation. Results from recent and on-going investigations in our lab have shown that ROS can readily modify amino acid residues, produce reactive carbonyls, and alter the structure of myofibrillar proteins, generating myosin polymers and aggregates through both noncovalent (predominantly hydrophobic) and covalent (e.g., disulfide, carbonyl-amine complex, and dityrosine) interactions. Mild oxidation with low concentrations of ferrous ion (0.01-0.05 mM), hydrogen peroxide (0.05-5.0 mM), and metmyoglobin (0.01-0.1 mM) enhances gelling and emulsifying capability of myosin and promotes hydration of muscle tissue, while excessive oxidation impairs the above properties. Myosin cross-linking at both light (LMM) and heavy (HMM) meromyosin sites and the formation of canals between muscle fibers are responsible for ROS-mediated protein functionality and muscle hydration changes, respectively.

AGFD 99 Novel substituted diphenylamine fungicide Changling Liu, liuchangling@sinochem.com, Huichao Li; Guang Huang Zhinian Li; Minna Zhu Department of Agrochemical Discovery, State Key Laboratory of the Discovery and Development of Novel Pesticide, Shenyang Research Institute of Chemical Industry Co., Ltd., Shenyang Liaoning China Dept. of applied Chemistry, Shenyang Univ. of chemical technology, Shenyang Liaoning China The novel diphenylamine compounds with broad spectrum fungicidal activity and low toxicity were discovered by using the new agrochemical discovery approach "intermediate derivatization method" developed and widely used in our lab. Lead compound 1 with some fungicidal activity was discovered by replacing substituted benzene ring of fungicide Fluzinam with intermediate M2 from M1. To discover compounds with better fungicidal activity, a number of substituted diphenylamines in formula 2 were synthesized. After optimization and screening, SYP-14288 was finally selected as a promising fungicide showing excellent efficacy against cucumber downy mildew, rice blast and cucumber grey mold and so on both in greenhouse and field trials.

AGFD 100 Highly sensitive quantification of unconjugated metabolites of trenbolone acetate in bovine serum by liquid chromatography-tandem mass spectrometry Qingsong Cai, qingsong.cai@tiehh.ttu.edu, George P. Cobb; Hongxia Guan Dept. of Environmental Toxicology, Texas Tech Univ., Lubbock Dept. of Chem., Western Illinois Univ., Macomb Illinois Trenbolone acetate (TBA) is a synthetic anabolic steroid. It has been used alone or combined with other estrogens as a powerful growth promoter in cattle husbandry practices for decades. Upon ear implantation, TBA is rapidly hydrolyzed to 17 β -trenbolone (17 β -TBOH), the active form which could be further biotransformed to trenbolone (TBD) and 17 α -trenbolone (17 α -TBOH). When used appropriately, they have proven beneficial in veterinary medicine. However, inappropriate use of these compounds can result in negative effects, mediated primarily through endocrine disruption. Therefore, the need to quantify these metabolites in bovine serum is of interest from pharmacokinetics and chemical-residue monitoring perspectives. Radioimmunoassay (RIA), gas chromatography-mass spectrometry (GC-MS) and liquid chromatography-tandem mass spectrometry (LC-MS/MS) have been used to quantify TBA metabolites in biological samples. However, RIA method is less specific due to antibody cross-reactivities. GC-MS analysis is often problematic because these metabolites are thermally labile. LC-MS/MS is the method of choice; nevertheless it has difficulty in determination of native steroids at low pg/mL levels. Herein, a highly sensitive LC-MS/MS method using electrospray ionization was developed for the determination of the three major TBA metabolites in bovine serum. The sample preparation essentially involved solid-phase extraction and pre-column derivatization. The derivatives were separated by reversed-phase LC and detected with MS/MS. Several derivatizing reagents including Girard T hydrazine, Girard P hydrazine, dansyl hydrazine, and 2-hydrazino-1-methylpyridine were compared in terms of sensitivity and specificity for the oxosteroids. The method was tentatively validated according to European Commission Decision 2002/657/EC guidelines.

AGFD 101 Effect of washing treatments and sonication on pesticides in tomatoes Fadwa Al-Taher , altaher@iit.edu.; Jack Cappozzo Yang Chen IIT, Nat'l Ctr. for Food Safety and Tech., Summit-Argo IL There is interest in reducing pesticide residues in fruits and vegetables. The objectives of this study were to determine the effect of washing treatments and sonication on pesticide removal from tomatoes and assess the effect of a water wash in incurred samples using a produce-washing flume. Tomatoes were contaminated with acephate, malathion, carbaryl, bifenthrin, cypermethrin, permethrin, cyhalothrin, chlorothalonil and imidacloprid and dried overnight. The tomatoes were then washed (10°C, 1 min) with water, sodium hypochlorite, peroxyacetic acid and Tween 20, respectively, with and without sonication. A separate experiment measured pesticide residues in incurred samples washed in a flume (22°C, 1 min). Washing treatments that included sonication proved the most effective in reducing pesticide residues in tomatoes. Pesticide residues were reduced up to 70% after washing fruits for 1 min in the flume. Future work will examine effects of washing treatments and sonication on other food.

AGFD 102 Comparative metabolic pathways of [14C]-chlorantraniliprole in the ruminant goat and monogastric rat and hen Venkat Gaddamidi venkat.gaddamidi@usa.dupont.com, Stine-Haskell Res. Ctr., Newark DE; Scott R Swain Crop Protection, E. I. du Pont de Nemours and Co., Newark DE US Chlorantraniliprole (DuPont™ Rynaxypyr™) is a novel anthranilic diamide insecticide and marketed primarily as DuPont™ Coragen™, DuPont™ Altacor™, and DuPont™ Prevathon™ insecticides. Metabolism of [14C]-chlorantraniliprole {3-Bromo-N-[4-chloro-2-methyl-6-[(methylamino)carbonyl]phenyl]-1-(3-chloro-2-pyridinyl)-1H-pyrazole-5-carboxamide} was investigated in ruminant goat, monogastric rat and hen. A total of 19 metabolites including 3 glucuronide conjugates and intact chlorantraniliprole were identified in the feces, urine, or tissues by comparison of their HPLC retention times, mass spectral fragments (LC-MS/MS) or Multiple Reaction Monitoring (MRM) transitions to authentic synthesized standards. There were minor variations in the metabolic pathways among the ruminant and monogastric animals. The major metabolic pathways of [14C]-chlorantraniliprole in these animals were: N-demethylation, methylphenyl hydroxylation and further oxidation to the carboxylic acid; loss of water from the N-hydroxymethyl group to yield cyclic metabolites; and hydrolysis of N-methyl amides to form benzoic acid derivatives. Minor metabolic reactions involved cleavage of the amide bridge between the phenyl and heterocyclic rings of chlorantraniliprole.

AGFD 103 Determination of benzo[a]pyrene in palm-derived tocotrienols Shary Ong, shary.ong@davoslife.com Dept. of Tocotrienol Research Laboratory, Davos Life Science, Singapore Benzo[a]pyrene (BaP) is classified as a polycyclic aromatic hydrocarbon (PAH) with carcinogenic potential. Although a current analysis method used to determine BaP (AOCS Cd 21-91) is optimized for oils and fats, the method requires procedural changes for samples rich in palm-derived tocotrienols. Recently, tocotrienols were demonstrated to improve human cardiovascular health. Here, we report a modified clean-up step to achieve two objectives: 1) pre-concentration of BaP, and 2) removal of non-polar impurities that interfere with the subsequent fluorimetric detection and quantitation of BaP. Integrating the modified clean-up procedure into AOCS Cd 21-91, our BaP spike-in experiments yielded a HPLC peak area that correlates linearly with the BaP concentration. The limit of quantitation (LOQ) for the integrated procedure remains 0.1 ppb (ug/L) as stipulated by AOCS Cd 21-91. In conclusion, current modified clean-up step should be incorporated for quantification of the BaP level in tocotrienol rich sample.

AGFD 104 Lactic acid bacteria as a biomarker to detect rodenticides in milk Madhavi H. Hathursinghe, madhavih2006@yahoo.com; Salam A. Ibrahim; Rabin Gyawali; Mehrdad Tajkarimi Family and Consumer Sciences, North Carolina A&T State Univ., Greensboro NC The objective of this study was to determine if lactic acid bacteria can be used as a biomarker to detect the presence of rodenticides in milk. Serially diluted rodenticides were added (500 µl/tube) to tubes containing MRS broth and five commercial yogurt cultures (A, B, C, D, and E), and incubated at 37 °C for 6h. Yogurt cultures showed highest sensitivity to diphacinone at the level of 0.005 mg/ml. Yogurt cultures C, D, and E showed detectable sensitivity to brodifacoum at the level of 0.02 mg/ml, whereas A and B showed detectable sensitivity at the level of 0.04 mg/ml and 0.01 mg/ml respectively. All the cultures were sensitive to bromadiolone at 0.04 mg/ml except D (0.02 mg/ml). Our results indicate that lactic acid bacteria could be used as biomarker for the early detection of the presence of rodenticides in milk.

AGFD 105 Impact of rodenticides on the coagulation properties of milk Nathan T. Georgette nathan.georgette@college.harvard.edu., North Carolina A&T State Univ., Greensboro NC; Tom Tse ; Salam A. Ibrahim Family and Consumer Sciences, North Carolina A&T State Univ., Greensboro NC This study investigates the impact of the rat poisons strychnine, bromadiolone, and brodifacoum on milk coagulation properties. Significant changes in these coagulation parameters could help reveal the presence of these toxins. Each tested toxin was dissolved in acetone (10 mg/ml) and an equivalent volume of acetone was added to each milk control. Bromadiolone and brodifacoum at sub-LD50 levels did not cause milk pH to drop out of its normal range. Rheometer data demonstrated that contamination with these toxins increased rennet coagulation time (P< 0.01). The toxins also significantly reduced the crosslink density of the gel network (P< 0.05). Bromadiolone and brodifacoum had minimum detection thresholds. Strychnine at 20% of the median lethal dose increased the milk pH out of its normal range with an increase of 0.15. This study suggests that the toxins may interact with the surface of casein micelles and interfere with micelle aggregation.

AGFD 106 Effect of sanitizer solutions on the stability of ricin dried on a stainless steel surface in the absence and presence of food matrices Lauren S. Jackson, Lauren.Jackson@fda.hhs.gov ; Katarzyna Banaszewski; Claire Chang William Tolleson NCFST, U.S. FDA, Summit-Argo IL NCFST, Illinois Inst. of Tech., Summit-Argo IL U.S. FDA/NCFST, Oak Ridge Inst. for Science and Education Summit-Argo IL NCTR., FDA, Jefferson AR Ricin is a potent cytotoxin found in the seeds of the castor bean plant. In the case of a deliberate contamination event with ricin in a food processing facility, remediation of the food-contact surfaces must be done safely and effectively. The objective of this study was to identify chemical treatments that could be used to inactivate ricin on a stainless steel surface in the absence and presence of different food matrices. Solutions of ricin alone or mixed with milk-based infant formula, pancake mix or peanut butter were pipetted onto the surface of stainless steel coupons. The coupons were allowed to air dry, and then exposed to solutions containing different concentrations of sanitizers [sodium hypochlorite (NaOCl), peroxyacetic acid (PAA), or quaternary ammonium compounds (QAC)] for up to 5 min. A ricin-specific ELISA was used to monitor the loss of ricin as a function of contact time

with the sanitizer solutions. NaOCl was the most effective of the sanitizers studied here at inactivating ricin, as determined by the loss in ELISA detection. The half-lives of ricin exposed to 5, 10 and 20 ppm NaOCl in the absence of food matrices were 78.2 ± 1.9 , 38.2 ± 3.6 and 24.3 ± 2.7 sec, respectively. Significantly ($p < 0.05$) higher sanitizer concentrations were needed to inactivate the toxin in the presence of the food matrices. The results indicate that NaOCl may be an effective chemical treatment for inactivating ricin on food-contact surfaces.

AGFD 107 NBO analysis and vibrational frequencies of citrinin: A density functional study Michael Appell, michael.appell@ars.usda.gov David Moravec; Wayne B. Bosma Bacterial Foodborne Pathogens & Mycology Research, USDA-ARS, Nat'l Ctr. for Agricultural Utilization Research, Peoria IL Dept. of Chemistry & Biochemistry, Bradley Univ., Peoria IL Citrinin is a toxic polyketide contaminant of a number of agricultural commodities, notably *Monascus*-fermented red mold rice. Detailed structures and electronic properties of three tautomeric forms of citrinin were investigated using density functional theory calculations at various extended basis sets and levels of theory. The p-quinone and o-quinone tautomers possess similar energies, and the energetic preference is basis set dependent. A carboxylic acid enol tautomer is stabilized through intramolecular hydrogen bond interactions, and within 2.4 kcal/mol at the B3LYP/6-311++G(d,p) level of theory. Despite differences in bond nature and connectivity of the tautomers, Natural Bond Orbital analysis revealed the tautomeric forms share similar natural charges and natural electron configurations. Vibrational assignments were made on frequencies calculated at the B3LYP/6-31G(d,p) level. Results for the p-quinone and o-quinone tautomers compared favorably with published spectra.

AGFD 108 Detection of high fructose corn syrup adulteration in single-source honey samples via SNIF-NMR April D. Hennis Marchetti, amarchet@rmc.edu, Mandie Lever Dept. of Chemistry, Randolph-Macon College, Ashland VA The detection of adulterants in food products is an active area of agricultural chemistry. One product of interest is single-source honey, which is honey obtained by the selective pollination of certain types of plants, for example the tupelo tree or lavender. These honeys command a high price in the consumer market but are relatively costly to produce. One method of honey adulteration involves adding the inexpensive sweetener High Fructose Corn Syrup, which is difficult to detect when mixed with natural honey because its chemical makeup is nearly identical. The purpose of this project is to develop a reliable method to detect HFCS adulteration in single-source honey samples, using SNIF-NMR to determine relative distribution (R) and concentration (C) of deuterium atoms in ethanol produced from the fermentation of honey samples. These values were compared to R and C values from synthetic ethanol and HFCS, and it was determined that differentiation between the two sugars and between different honey sources is possible.

AGFD 109 Antimicrobial activity of lactic acid, acetic acid, and copper on growth of *Cronobacter* spp. (*Enterobacter sakazakii*) in laboratory medium and fluid food products Salam A. Ibrahim, ibrah001@ncat.edu, Mehrdad Tajkarimi, Mtajkari@ncat.edu, North Carolina A&T State Univ., Greensboro NC Rabin Gyawali; Saeed A. Hayek; Leonard L. Williams Family and Consumer Sciences, North Carolina A&T State Univ., Greensboro NC North Carolina Research Campus, North Carolina A&T State Univ., Kannapolis NC The objective of this study was to determine the effect of lactic acid (0.2%), acetic acid (0.1%) and copper sulfate (50ppm) on the survival and growth *E. sakazakii* in laboratory medium as well as food products. Bacterial growth was monitored during the incubation period for 8h at 37° C. Lactic acid (0.2%) or acetic acid (0.1%) alone retarded the growth of *E. sakazakii*. However, the growth of *E. sakazakii* was significantly inhibited when 0.2 % lactic acid or 0.1% acetic acid in combination with 50 ppm copper sulfate were added into BHI broth and food model. The death rate of *E. sakazakii* was more rapid in the apple juice samples in the presence of copper in combination with either 0.2% lactic or 0.1% acetic acid. These findings indicated that lactic acid, or acetic acid in combination with copper sulfate, could be used as natural inhibitor for the growth of pathogens

AGFD 110 Chemosensor arrays for the identification of heat-denatured protein Danqun Huo, huodq@cqu.edu.cn Changjun Hou; Jiale Dong; Guoping Zhang; Yuchang Zhang College of Bioengineering, Chongqing Univ., China Key Laboratory of Biotheological Science and Technology, Chongqing Univ., China The effect of heat-denature on the foaming properties and molecular structure was studied by using colorful chemosensor arrays. The colorimetric sensor arrays were fabricated by printing chemical selectively responsive dyes on hydrophobic membranes, and bovine serum albumin (BSA) and albumin were used as model proteins. Digital images of the sensor arrays before and after exposure to the proteins solution provided direct profiles of color change, serving as the unique fingerprint for specific protein samples. In order to learn the mechanism of the interaction between chemosensor array and proteins, fluorescence experiments were displayed here. And the fluorescence spectra results showed that the foaming capability of BSA and albumin was changed with heat-denatured temperature. The surface hydrophobicity may be one of the most important factors determining the foaming capability of proteins. Protein-protein interactions play a key role on foam stability.

AGFD 111 Effects of processing conditions on availability of nutraceuticals in whole wheat bread with cold-pressed grape seed flour and oil Junjie Hao, immune@umd.edu, Lena Binzer; Rebecca Brinsko; Jessica Cha; Serena Chen; Sarah Green Kelly Grob; Christina Hitz; Laura Li; Sowmya Swamy; Maxim Y Wolf; MengMeng Xu; Mary Yanik; Margaret Slavin; Liangli (Lucy) Yu Gemstone Undergraduate Research Program, Univ. of Maryland, College Park Dept. of Nutrition and Food Science, Univ. of Maryland, College Park A whole wheat bread product was selected as the functional food model for increasing nutraceuticals in diets through incorporation of cold-pressed grape seed oil and grape seed flour. Antioxidant activities, measured as total phenolic content (TPC), DPPH radical scavenging capacity (RDSC), and peroxy radical scavenging activity (ORAC), were compared between the bread samples with and without grape seeds. Effects of temperature and time during baking on the availability of nutraceuticals were also evaluated. Bread made by substituting canola oil and half of the whole wheat flour with grape seed oil and flour exhibited increase in TPC, RDSC, and ORAC values of over 400%, 1700%, and 900%, respectively. In addition, moderate thermal treatment reduced nutraceutical availability, while extended thermal treatment might be able to enhance nutraceutical properties of bread samples, suggesting that optimization of processing conditions can significantly improve availability of nutraceuticals in functional food products.

AGFD 112 Substituting applesauce for fat (butter) in chocolate chips cookie Saeed Hayek, safesaed@yahoo.com; Salam A. Ibrahim; Hanna J. Khouryieh Family and Consumer Sciences, North Carolina A&T State Univ., Greensboro NC Food Processing and

Technology, Western Kentucky Univ., Owensboro KY The objective of this study was to examine the consumer acceptability of fat free chocolate chips cookies made with applesauce as fat replacement. Sensory evaluations were completed on campus with a group of faculty, staff and students. Cookie characteristics evaluated were: appearance, texture, color, chewiness, moistness, sweetness, flavor, aftertaste, and overall liking. Two versions of the cookies were prepared: one in which applesauce replaced half (50%) the fat (butter) and another in which replacement was 100% of the butter used in the chocolate chip cookie recipe. Chocolate chip cookies made with butter were used as control samples. The overall results of the sensory ratings indicated that acceptance was higher for 50% replacement when compared with 100% replacement and control samples. The results indicate that applesauce might be an acceptable substitute for fat in cookies, which would contribute to lowering the consumption of fat in the American diet.

AGFD 113 Thermal properties of encapsulated polyunsaturated fatty acid esters Ronald A Holser, Ronald.Holser@ARS.USDA.GOV, Dept. of Agriculture, Richard Russell Res. Ctr., Athens GA, Solid lipid particles were prepared to inhibit the degradation of polyunsaturated lipids used in food and feed formulations. Encapsulation with solid lipid particles can provide a physical barrier to limit the mass transfer of prooxidant compounds and by the appropriate selection of lipid particle composition also present an energy barrier. The ability of saturated and monounsaturated medium chain length triglycerides to stabilize the polyunsaturated lipids linolenate and docosahexaenate were measured by differential scanning calorimetry (DSC) and thermal gravimetric analysis (TGA). Reversible and irreversible changes were detected by operating the calorimeter with a small temperature oscillation superimposed on the temperature ramp (modulated-DSC). The structure and position of the fatty acid components of the triglycerides exhibited a strong influence on melting point, heats of fusion, and crystallinity. These results will be useful in the selection of triglycerides to encapsulate bioactive lipids formulated into foods and animal feeds.

AGFD 114 Oxidative cross-linking of sugar beet pectin and β -lactoglobulin and improved functional properties Jiyoung Jung, jypw47@gmail.com, Louise Wicker Dept. of Food Sci & Tech., Univ. of Georgia, Athens GA Laccase, an oxidative enzyme with broad substrate specificity, oxidizes phenolic compounds. Ferulic acid in sugar beet pectin (SBP) and tyrosine in β -lactoglobulin (BLG) are potential substrates for laccase catalyzed formation of homo- and hetero-conjugates. The aim of this work is to determine if laccase cross-links SBP and SBP-BLG and to determine the effect on functional properties of homo- and hetero-conjugates. Conjugation of SBP and SBP-BLG was confirmed by multi angle laser light scattering, refractive index, and UV detection. Laccase treated SBP had larger molecular weight and more compact, branched structure. Furthermore, heteroconjugates of BLG and SBP were formed with laccase and conjugation, which was improved by pre-heating BLG. During 30 days storage, emulsions prepared with homo-conjugates of SBP stabilized emulsions retained smaller (D 43) and more uniform particle size (light microscopy) than non-conjugated SBP. SBP-BLG conjugates showed ~35% higher solubility at isoelectric point of BLG.

AGFD 115 Identification and quantitation of six phenolic amides from Amaranthus Hans A. Pedersen, hans.albert.pedersen@gmail.com; Stine K. Steffensen; Carsten Christophersen Anne G. Mortensen; Lise N. Jørgensen; Selene Niveyro; Rosa M. de Troiani; Ricardo J. Rodríguez-Enríquez; Ana Paulina Barba-de la Rosa; Inge S. Fomsgaard. Dept. of Chemistry, Univ. of Copenhagen, Denmark Dept. of Integrated Pest Management, Aarhus Univ., Copenhagen Denmark Facultad de Agronomía, Universidad Nacional de la Pampa, Santa Rosa La Pampa, Argentina Departamento de Biología Molecular, Instituto Potosino de Investigación Científica y Tecnológica, San Luis Potosí San Luis Potosí Mexico Six phenolic amides have been identified and quantified in amaranth using a simple synthesis and a straight forward LC-MS/MS method. Four of the amides had not previously been reported from amaranth, and no quantitative LC-MS method had been reported. Identification and quantification was achieved from a synthesized library of amides since several similar compounds have been reported in diverse plant species. Identification of 25% of the synthesized amides indicates that these compounds are widely distributed in the plant kingdom, and this is the first time six phenolic amides are reported from the same plant. Concentrations of phenolic amides vary widely: feruloyltyramine was present in quantities of 5.3 to 114.3 $\mu\text{g/g}$ and feruloyldopamine in quantities of 0.2 to 10.3 $\mu\text{g/g}$, depending on the plant sample. Nutritional and health impacts of phenolic amides should be studied. This work was part of the European Commission sixth Framework Programme contract number 032263 AMARANTH: FUTURE-FOOD.

AGFD 116 "Green" purification of radish (*Raphanus sativus* L.) anthocyanin-rich extracts using chitosan Pu Jing, pjcolumbus@gmail.com Key Lab of Urban Agriculture (South), Shanghai Jiao Tong Univ., China This study developed a chitosan-treatment procedure to remove impurities from radish anthocyanin extracts to promote its utilization as natural food colorants using a Box-Behnken experimental design. Effects of purification conditions (independent variables) including pH (3.7, 4.0, and 4.3), chitosan concentration (1.5, 2.0, and 2.5 g/100 mL), and treatment duration (2, 2.5, and 3 hr) on anthocyanin content, glucosinolate content, and clarity of radish anthocyanin-rich extracts (dependent variables) were investigated. A preferred treatment condition was determined as chitosan treatment for 2.74 hr at pH 3.92 with an initial chitosan concentration of 1.59 g/100 mL, according to the desirability function analyses. The level of glucosinolates was reduced by ~61% and clarity was enhanced by ~92%, whereas anthocyanin recovery was ~95% under the selected purification conditions. This chitosan-treatment procedure uses a biodegradable agent, and is safe, economic and efficient for solving the off-flavor and clarification problems of radish anthocyanin extracts.

AGFD 117 Antioxidant activity of selected new world wines Blair Ringley, sergeschreiner@rmc.edu, Serge Schreiner Dept. of Chemistry, Randolph-Macon College, Ashland VA The antioxidant capacity of selected red wines using their superoxide-scavenging ability was measured through the percent inhibition of nitro blue tetrazolium (NBT) reduction. $\text{NADH} + 2\text{O}_2 \rightarrow \text{NAD}^+ + 2\text{O}_2^- + \text{H}^+$ $\text{O}_2^- + \text{NBT (oxidized)} \rightarrow \text{O}_2 + \text{NBT (reduced)}$ The absorbance of a typical sample was measured at 562 nm. As the concentration of antioxidants in a wine sample increased, less NBT was reduced. Using this assay, it was attempted to assess whether factors such as region of vinification and grape varietal alter the levels of antioxidants. Preliminary results seem to indicate that Cabernet Sauvignon, Merlot, and Shiraz have similar high antioxidant capacities while Pinot Noir has a significantly antioxidant activity.

AGFD 118 Antioxidant activity of red and white wine in inhibiting cholesterol oxidation Ling Tian, tianling2008@yahoo.com; min zhi Xu; Hua Wang Food Science, Louisiana State Univ. Agricultural Ctr, Baton Rouge Louisiana State

College of Food Sci. and Eng., Northwest A&F Univ., Baton Rouge Louisiana State College of Enology, Northwest A&Univ., Yangling Shaanxi China The antioxidant activities of Merlot red wine and Chenin Blanc white wine in inhibiting cholesterol oxidation were investigated using a cholesterol oxidation model system. At 1:10 ratio of the wine to cholesterol emulsion (1000 ppm), the red wine completely inhibited cholesterol oxidation, while the white wine only had 15% of inhibition capability compared with control after 3 days cholesterol oxidation. Antioxidant activities of three fractions of the red wine, 1) hexane extract, 2) fraction not absorbed by a C18 SPE tube, 3) fraction eluted from the C18 SPE tube by methanol, were evaluated as well. It was found that the antioxidant activity of the third fraction was equivalent to the total activity of the red wine. Thus, the antioxidant activity of the red wine was contributed by the phenolics and polyphenols absorbed by C18 tube. This study demonstrated red wine has much higher capability than white wine in preventing cholesterol oxidation.

AGFD 119 Investigation on gamma-aminobutyric acid as an inhibitor of formation of advanced lipoxidation end-products: Its interaction with malondialdehyde Nongyue He, nyhe1958@163.com; Bin Liu, sslb_112@hotmail.com, Sipai Lou, Nanjing Jiangsu China ; Yan Deng; Lijian Xu; Xiaolong Li State Key Laboratory of Bioelectronics, Southeast Univ., Nanjing Jiangsu China Hunan Key Laboratory of Green Packaging and Biol. Nanotechnology, Hunan Univ. of Tech., Zhuzhou Hunan China In this research, the obtained evidence supports the hypothesis that gamma-aminobutyric acid (GABA) can trap malondialdehyde (MDA) indirectly or directly. In vitro, the reaction between GABA with fatty acid, can be confirmed by detecting the formation and yield of MDA and the consumption of GABA. This shows that GABA can trap the reactive intermediates during lipid peroxidation. Study of the direct reaction between GABA and MDA indicated that GABA reacts readily with MDA under supraphysiological conditions to form different products. A nonfluorescent enamine and a lipofuscin-like fluorescent 1,4-dihydropyridine were obtained experimentally from reaction of equimolar of GABA and MDA and were detected by means of high performance liquid chromatography (HPLC) separation for the reaction mixtures at 48 h. The results suggest that scavenging effects of GABA on reactive carbonyl compounds may play an important role in inhibiting formation of advanced lipoxidation end products and GABA, as a potent antioxidant or additive, is a novel functional factor for nutraceuticals.

AGFD 120 Anti-carcinogenic and anti-inflammatory properties of nobiletin and 3',4'-didemethylnobiletin Grace S. Chang, simpledevotion@gmail.com The College Preparatory School, The College preparatory School, Broadway, Oakland CA Nobiletin, a naturally occurring polymethyl flavone (PMF) present in citrus fruits and 3',4'-didemethylnobiletin (DDMN), the major metabolite of nobiletin in mouse urine, have been shown to have a broad spectrum of beneficial attributes. This study focuses on the anti-carcinogenic and anti-inflammatory properties of these compounds. The results demonstrated that both nobiletin and DDMN were able to induce cytotoxicity, cell cycle arrest and apoptosis in COLO205 cancer cells. Nobiletin showed to be more effective in inducing apoptosis than its metabolite DDMN. In addition, in COLO205 cancer cells, treatment with nobiletin resulted in G1 phase cell cycle arrest, whereas DDMN caused G2/M phase arrest. In anti-inflammatory analysis, DDMN showed a greater degree of anti-inflammatory activity in nitrite assays. In addition, Western blotting analysis also indicated that DDMN is a better inhibitor of iNOS and COX-2. These results suggest that nobiletin and DDMN may exert different bioactivity by their targeting in different components.

AGFD 121 Lycopene effects in tissue culture cells Teresa Golden tgolden@se.edu Bradley Jones; Andrew Tabor Michael Cloyde Rebekah Ritchie Angela Davis Penelope Perkins-Veazie Biological Sciences, Southeastern Oklahoma State Univ., Durant OK USDA, ARS, Lane OK NC Research Campus, Kannapolis NC Lycopene is an antioxidant from the carotenoid family of phytochemicals produced in plants. It is recognizable as the red color in fruits and vegetables such as tomatoes and watermelon. Unlike many other carotenoids it lacks a terminal beta-ionic ring and provitamin A activity. It is a relatively stable and easily absorbed molecule distributed throughout the body by the circulatory system. Recently it has become the focus of nutritional and clinical studies focused on prevention of prostate cancer and cardiovascular disease. While these studies focus on the antioxidant properties of lycopene, several other mechanisms of action have also been indicated including gene functional regulation, hormone or immune regulation, carcinogen metabolism and others. Many questions still remain. We have chosen to use tissue culture as a model to further examine the roles of lycopene including the effects on cancer cell growth and the potential protective roles in response to cell stress.

AGFD 122 Bioassay directed fractionation and anti-microbial activity of Lippia sidoides Aimee J Gowell aimee.gowell@amway.com; Kausar Malik; Amit Chandra Dept. of Analytical Services-Consumables R&D, Amway Corporation, Ada Michigan Lippia sidoides is a botanical native to Brazil that has gathered tremendous interest due to its health benefits. One area of high interest has been its anti-microbial activity. Lipophilic and hydrophilic phytochemicals (including essential oil) present in the aerial parts of Lippia sidoides were isolated using sequential fractionation (solvent/solvent) technique. This paper will discuss the fractionation and phytochemical fingerprint studies by HPLC and GC-MS as well as results from bioassay studies for anti-microbial activity.

AGFD 123 Anticancer and antioxidant activities of fatty ester derivatives of carnolic acid Asharani Prasad, asharani.prasad@ndsu.edu Clifford Hall III Dept. of Food Safety, North Dakota State Univ., Fargo Carnolic acid is one of the major bioactive constituents in rosemary leaves responsible for the antioxidant and anticarcinogenic effects. It has been known that carnolic acid, carnolic acid o-quinone and its analogues having carboxylic acid group at C-20 have low cytotoxic activity on different leukemia cells. The low cytotoxic activity is due to dissociation of carboxylic acid functionality at C-20, which does not allow the compounds to permeate into the cells. A methyl ester group at C-20 of carnolic acid enhances the cytotoxic activity against leukemia cells. Carnolic acid, due to its polar nature, also has low antioxidant activity in emulsion-type of food systems. Problem associated with low anticancer activity on leukemia cells and low antioxidant activity in emulsion-type of food system was addressed by synthesizing fatty ester derivatives of carnolic acid. The present work will outline the antioxidant and anticancer activities of fatty ester derivatives of carnolic acid.

AGFD 124 Antioxidant effects of polyphenols from Artemisia tridentata ssp. tridentata in HepG2 cells Emir / Kobic, emir.kobic@yotes.collegeofidaho.edu, Chemistry, The College of Idaho, Caldwell Idaho 83605, US The western US is dominated by the plant family Asteraceae. The subgenus, Artemisia tridentata ssp. tridentata, or basin big sagebrush, is known to produce diverse

polyphenolic compounds. It has been suggested that diets high in flavonoids, such as vegetables, fruits, and tea, can decrease susceptibility to degenerative diseases such as stroke, heart disease, and cancer. Although the mechanism by which polyphenols offer protection is not completely understood, it is thought that these compounds affect cellular redox state, cell signaling, and pro-apoptotic pathways. The present study is an investigation in the biological activity of sagebrush polyphenols in cell proliferation and defense against oxidative stress. Cultured HepG2 liver cells treated with polyphenol-containing extracts of *A. tridentata* ssp. *tridentata* showed reduced proliferation in a time and dose dependent manner. Effects of extracts on cellular glutathione levels in HepG2 cells were also examined. This study may provide a novel source of bioactive polyphenols.

AGFD 125 Micro-oxygen processing and detection of biochemical deteriorative vectors in bananas Solandre E Perez Almeida, sperez83@uga.edu; Jake H Mulligan; Aaron L Brody; Louise Wicker Food Sci & Tech., The Univ. of Georgia, Athens The effect of micro-oxygen on polyphenoloxidase (PPO) activity was evaluated at atmospheric and ppm oxygen concentrations. PPO activity decreased non-linearly with decreasing oxygen concentration from 198 to 45 Units/mL at atmospheric and micro-oxygen (8 ppm), respectively. The decrease in PPO with oxygen followed a second order polynomial regression ($R^2 > 0.9$). Raman spectra taken initially and at four minutes of PPO reaction with catechol and four peaks at 1282, 1257, 1338 cm^{-1} and reference at 1850 cm^{-1} were quantified for differences in peak ratio. There was no quantifiable difference at different times and oxygen concentrations. PPO activity in catechol with time increased as a hyperbolic curve under atmospheric conditions. Under micro-oxygen conditions, PPO activity in catechol decreased after longer times of assay. Particle size and light scattering analysis indicated no large increase in particle size. The decrease in absorbance at longer times may be the result of non-Michaelis-Menton kinetics.

AGFD 126 Flavanones with neuraminidase inhibitory activity from the roots of *Amorpha fruticosa* L Young Soo Kim allinjunhyun@hanmail.net, Heung Joo Yuk; Young Bae Ryu Woo Song Lee; Ki Hun Park Dept. of Applied Life Science, Gyeongsang National Univ., Jinju, Republic of Korea Reserch Inst. of Bioscience and Biotechnology Jeongeup, Republic of Korea The development of inhibitors of neuraminidase may provide a new weapon for the treatment of bacterial pathogenic disease that arises from hydrolysis of sialic acid. A series of neuraminidase inhibitory flavanones 1-5 was isolated from the roots of *Amorpha fruticosa* L.. The IC₅₀ values of compounds 1-5 were determined a range between 0.1-22.0 μM against bacteria neuraminidase. The most potent neuraminidase inhibitor 1 (IC₅₀ = 120 nM) displays more than 100 times effective than mother molecule, eriodictyol (IC₅₀ = 16.4 μM). Inhibitor 1 feature that three prenyl groups are attached on 6, 8, 4' position of eriodictyol. Interestingly, structure-activity studies reveal that these flavanones show different kinetic inhibition mechanism depending upon the arrangement of prenyl groups. Compound 2 possessing a 6, 8-prenyl motif on A-ring operated under a competitive inhibition, whereas other flavanones display non-competitive inhibitions.

AGFD 127 Polyphenols of soybean leaves, displays potent α -glucosidase inhibitory activity Heung Joo Yuk, cupid6@hanmail.net, Young Soo Kim Jung Keun Cho ; Tae-Sook Jeong ; Ki Hun Park Dept. of Applied Life Science, GyeongSang National Univ., Jinju, Republic of Korea National Research Laboratory of Lipid Metabolism & Atherosclerosis,, Daejeon, Republic of Korea We present an intensive study on the polyphenols within soybean leaves, which are eaten widely in the south of Korea as a seasonal vegetable. The organic extract of soybean leaves showed a high α -glucosidase inhibitory activity. To investigate the compounds responsible for this effect, activity guided fractionation of soybean leaves by chromatography yielded seven phenolic compounds which were identified as formononetin , afromosin , coumestrol , isotrifoliol , phaseol , glyceofuran and a new compound, glyceollin V . Importantly, coumestrol was not only the most potent component with IC₅₀ = 6.0 μM , but also the most abundant polyphenol in soybean leaves. The increasing inhibition shown across the developmental stage of the plant, correlated strongly with increase in compound in the leaves. In fact we show that it can comprise up to 65% of the polyphenols in the leaves by HPLC analysis.

AGFD 128 Extraction and characterization of sorghum polymeric proteins by size exclusion chromatography Brian Ioerger, brian.ioerger@ars.usda.gov Scott Bean Grain Quality and Structure Research Unit, USDA-ARS-Center for Grain and Animal Health Research, Manhattan KS An analytical method for separating unreduced sorghum proteins using size exclusion chromatography was developed. Extraction and separation conditions were optimized in terms of completeness of protein extraction, sample stability, and resolution. The efficiency of several different types of extraction solvents were evaluated including: chaotropes, detergents, and organic solvents. Sonication combined with a 50 mM Tris-borate pH 10.0 buffer with 2% sodium dodecylsulfate provided the most complete extraction (>90%) of unreduced protein. Heating the samples for 2 min at 80°C after extraction was found to be the most effective method for maintaining stability of the extracts, reducing degradation to <5% over a twenty-four hour period. Both silica and polymer based columns were evaluated for separating polymeric sorghum proteins. A silica based column with a nominal molecular weight range of 5 kD - 700 kD resulted in the best resolution of higher molecular weight fractions. Complete separation of all extracted proteins typically required 20 min or less.

AGFD 129 RP-HPLC analysis of sorghum protein digestibility Deidre L Blackwell, deidre.blackwell@ars.usda.gov Scott R Bean Center for Grain and Animal Health Research, USDA-ARS, Manhattan KS A diverse group of grain sorghum flours that span the genetic range of sorghum was screened for protein digestibility. Digestibility was determined using a rapid RP-HPLC method quantifying the main class of sorghum proteins, kafirins. Sorghum differs from other cereal proteins (e.g. corn and wheat) in that it has a lower in-vitro pepsin digestibility. Sorghum lines included tannin containing lines as well as high digestible mutants. The RP-HPLC method showed a wide range of protein digestibility (10 - 80%). Rapid analysis was achieved by using surface porous columns which decreased previous run times by a third and had good linear agreement to the standard nitrogen analysis. Using this method focuses on the digested protein and excludes any non-protein nitrogen containing compounds in the flour. Additionally, protein peak patterns among the different lines before, after, and during the digestion process can be compared and the key proteins influencing the digestibility identified.

AGFD 130 Analysis of phytochemicals in a traditional herbal remedy for BPH Nancy L Paiva , nlpaiwa@alum.mit.edu, Allen Baughman ; Stefan T Jones; Kym F Faull; Aris Villamil Dept. of Chemistry, Computer & Physical Sciences, Southeastern Oklahoma State Univ., Durant OK Pasarow Mass Spectrometry Laboratory, Univ. of California at Los Angeles, Los Angeles CA Tampa

Pathology Laboratory, Tampa FL In rural Colombia and other South American countries, adult men reduce the symptoms of benign prostatic hyperplasia (BPH) by consuming an herbal drink prepared by boiling ground, roasted seeds of a local plant in water. The seed source has been tentatively identified as a Cassia species, but genomic DNA sequences obtained from the Colombian herb are being compared with DNA sequences from authentic Cassia specimens to more conclusively identify the medicinal Cassia species. Given that whole seeds, leaves, and organic extracts of several Cassia species are toxic to livestock, hot water extracts are being tested for toxicity against various non-vertebrate organisms. One long-term goal is to identify phytochemicals present in the herbal remedy and compare phytochemical contents of extracts of US and Colombian-grown Cassia seeds. Future animal model studies could be used to determine the therapeutic effectiveness of crude aqueous extracts or specific phytochemical components in treating BPH symptoms.

AGFD 131 Isolation and identification of potential bioactive compounds from “Maguey” roots infusion and crude extracts Nashicel J Rodriguez, nashicel@gmail.com; Elba Reyes Chemistry, Univ. of Puerto Rico, Cayey Campus, Cayey Puerto Rico 00736, Puerto Rico Medicinal plants have a key role in the treatment of Diabetes mellitus. An ethnomedical study (unpublished result) has showed that people from Puerto Rico are using infusions from the roots of Maguey (Agave Genus) to treat this condition. Species from Agave genus have a demonstrated ethnopharmacological profile. Previous studies with Maguey leaves revealed the occurrence of bioactive constituent with hypoglycemic effect, namely saponins. In our project the point of interest is the isolation and identification of the antidiabetes metabolites present in the roots crude and infusion extracts. The isolation of organic compounds was performed with different extraction techniques. Due to the complexity of the crude extracts, derivatization's process was performed in addition to chromatographic separation for isolate and identifies organic compounds. In an effort to characterize organic compounds spectroscopic analyses were performed. Unexpected crystals were analyzed following different approaches. We will present our results of the extraction optimization, isolation and identification of Maguey's metabolites.

AGFD 132 Isolation and identification of potentially bioactive compounds from Momordica charantia L. "Cundeamor" Melvin J Aviles, melvin.aviles@upr.edu, Jessica Torres; Stefanie Rosado; Elba D Reyes Dept. of Chemistry, Univ. of Puerto Rico, Cayey Momordica charantia L. locally known as “Cundeamor” has been identified as natural medicinal source for diabetes treatment. According to regional claims, the tea preparation from the leaves is used for the reduction of blood glucose levels. Moreover a recent literature review revealed that species of this plant have been extensively studied, reporting the characterization of compounds with potential hypoglycemic activity from the leaves and fruit. However, in Puerto Rico “Cundeamor” has not been widely studied. In contradiction, a naturopathy product called Diabetplex (not approved by the Food Drug Administration) with specific “Cundeamor” powder doses was commercialized and recommended for diabetes treatment. Recognizing the variation of physical appearance of this plant amongst the countries, the overall chemical composition should have active metabolites. The purpose of this research is to validate the hypoglycemic properties of isolated compounds from Puerto Rico “cundeamor” species infusion and Soxhlet extracts. Currently, this research is in the middle stage. Preliminary spectroscopic results showed comparative and consistent signals in ¹H NMR analysis from the dichloromethane infusion and Soxhlet extracts with active compounds previously reported in the literature. As part of the methodology an infusion was performed in order to simulate home made tea preparation and a Soxhlet extraction with dichloromethane and water respectively, were carried out to obtain a crude extract. Column chromatography and HPLC analysis were used as purification techniques. Qualitative, quantitative and spectroscopic results obtained from infusion, Soxhlet and Diabetplex pills extracts will be presented.

AGFD 133 Determination of eleutherosides in dietary supplements containing Siberian ginseng by HPLC Aimee J Gowell aimee.gowell@amway.com; Kathryn Persons Amit Chandra Dept. of Analytical Services-Consumables R&D, Amway Corp., Ada Michigan Siberian ginseng (*Eleutherococcus senticosus*) is an adaptogen that has a wide range of health benefits. Specifically, medicinal properties in the areas of increased endurance and memory improvement have been reported. The major/unique phytonutrients in Siberian ginseng are triterpene saponins called eleutherosides B and E. Existing analytical methods in the literature do not meet our needs for determination of these components. This paper discusses our studies to develop and validate a reverse phase high performance liquid chromatography method for the identification and quantification of eleutherosides B and E as marker compounds for Siberian ginseng

AGFD 134 Enhancement of α - and β -galactosidase activity in *Lactobacillus reuteri* by metal ions Saeed A. Hayek, safesaheed@yahoo.com; Danfeng Song Salam A. Ibrahim; Mehrdad Tajkarimi Awfa Alazzeah Family and Consumer Sciences, North Carolina A&T State Univ., Greensboro NC Agriculture and Agri-Food Canada, Canada The objective of this study was to investigate the enhancement of α - and β -galactosidase activity in *Lactobacillus reuteri* by different metal ions. Ten mM of Na⁺, K⁺, Fe²⁺, Cu²⁺, Mg²⁺ and 1 mM of Mn²⁺ were added separately to the growth culture of six strains of *L. reuteri*. Results showed that the addition of Mn²⁺ ions produced the highest α - and β -galactosidase in CF2-7F. The addition of Mn²⁺ ions lead to enhancement of α - and β -galactosidase activity. The addition of Mn²⁺ in *L. reuteri* CF2-7F media produced a significantly higher ($p < 0.01$) α -galactosidase activity than the other metal ions. The addition of Cu²⁺ lead to a complete inhibition of growth of all strains. The addition of Fe²⁺ led to a significant ($p < 0.01$) decrease in the activity of both enzymes in most strains. This study shows that 0.0274% Mn²⁺ in the broth of *L. reuteri* CF2-7F would lead to enhancement of α - and β -galactosidase activity.

AGFD 135 Purification and characterization of a papaya (*Carica papaya* L.) pectin ethylesterase isolated from “Liquipanol” Brett J. Savary, bsavary@astate.edu Prasanna Vasu; Randall G. Cameron Arkansas Biosciences Institute, Arkansas State Univ., Jonesboro AR Quality Improvement in Citrus and Subtropical Products Laboratory, USDA-ARS, Winter Haven FL We are investigating the stable pectin methylesterase (PME) (EC 3.1.1.11) activity present in a commercial papain preparation (Liquipanol T-200). We are evaluating this enzyme for use to manipulate nanostructure in the food hydrocolloid pectin to introduce definable functionalities with improved consumer properties that are not available through conventional chemical processing. There is no information available on the protein responsible for the activity or its structural or functional properties. We isolated a single PME isoenzyme from the crude enzyme mixture, first using hydrophobic interaction and cation-exchange chromatography to separate the bulk of cysteine endopeptidase activities, then applying affinity chromatography with immobilized kiwi PME inhibitor protein for structure-specific purification. This provided a homogeneous protein as evidenced by electrophoresis and MALDI-TOF MS. Peptide mass fingerprinting by trypsin digestion

indicated this is a novel Carica PME isoform. We will present results on the purification and subsequent structural and biochemical characterization of this enzyme.

AGFD 136 Separation and identification of polyphenolic compounds from *Artemisia tridentata* ssp. *tridentata* using high-performance liquid chromatography coupled with diode array detection Jessica M Patton jessica.pattton@yotes.collegeofidaho.edu; Carolyn Dadabay Dept. of Chemistry, The College of Idaho, Caldwell Interest in polyphenolic compounds stems from studies which suggests that diets high in flavonoids are associated with health benefits such as decreased susceptibility to heart disease, cancer, and osteoporosis. Numerous polyphenols are produced in *Artemisia tridentata* ssp. *tridentata*, a sagebrush species native to the Great Basin region of the western US. Previous studies showed that extracts from *A. tridentata* ssp. *tridentata* exhibit antiproliferative and antioxidant activity in cultured cells. Reverse phase high-performance liquid chromatography (RP-HPLC) was optimized for the separation of polyphenolic compounds in extracts of *Artemisia tridentata* ssp. *tridentata*. Preliminary identification of six flavonoids which demonstrate biological activity was achieved through the comparison of retention times and UV absorption data. HPLC fractions were further analyzed using liquid chromatography coupled with electrospray ionization mass spectrometry. The collected electrospray ionization mass spectroscopy data further supported compound identification. *A. tridentata* ssp. *tridentata* may provide a source of biologically active polyphenolic compounds.

AGFD 137 Effect of microwave extraction on phenolic content of beans Atanu Biswas, atanu.biswas@ars.usda.gov PPL, NCAUR/USDA, Peoria IL The phenolic phytochemicals are associated with many health benefits, and it is useful to develop improved methods for its extraction from beans. In this work, we showed that extraction with microwave irradiation is an effective method for the determination of extractable phenolic content in beans. Eight beans were chosen that are important for the Northarvest region of North America, including North Dakota and Minnesota. For this study, four temperatures (25°C, 50°C, 100°C, 150°C) and three solvents (water, 50% ethanol in water, and 100% ethanol) were used. As expected, the more colored beans gave higher phenolic extractables, and the phenolic level in hull was much higher than in meat. Furthermore, higher temperatures provided higher levels of extractable phenolics. The most effective extraction was achieved at a temperature of 150°C with 50% ethanol in water as the extracting solvent. A comparison was made with conventional methods of extraction at 100°C. In all cases, microwave extraction was superior, producing 2-3 times more phenolics than conventional heat extraction.

AGFD 138 Characterization of anthocyanin profile and quantification of antioxidant activity in purple sweet potatoes prepared by different cooking methods Diep Ngan Nguyen nguyendt@hawks.rockhurst.edu; James M. Chapman Dept. of Chemistry, Rockhurst Univ., Kansas City Missouri Purple-fleshed sweet potatoes (PSP) have an attractive reddish-purple color with high levels of anthocyanins, total phenolics, and antioxidant activities. Recent research on nutraceutical properties of PSP indicate that the extracted anthocyanins exhibited strong radical scavenging activity, antimutagenic activity, and significantly reduced high blood pressure and liver injury in rats. Since these sweet potatoes are consumed by humans, our investigations focused on the common cooking methods to determine if the potentially beneficial anthocyanins degraded with different styles of preparation. The identity of the anthocyanins were determined by LCMS and confirmed by comparison to literature reports. The comparison of LCMS spectral profiles did not indicate differences in the types of anthocyanins present. This experiment shows that qualitatively the anthocyanins do not degrade during the cooking process. Additional experimentation was conducted to determine if the anthocyanins decreased quantitatively or underwent changes in antioxidant activity as a result of the different preparation methods.

AGFD 139 Characterization of tannin-metal complexes by UV-Visible spectrophotometry Steven R. Tindall tindalsr@muohio.edu; Ruiqiang Liu; Javier M. Gonzalez; Jonathan J. Halvorson; Ann E. Hagerman Dept. of Chemistry & Biochemistry, Miami Univ., Oxford OH Appalachian Farming Systems Res. Ctr., USDA, Beaver WV Tannins enter soils by plant decay and rain throughfall, but little is known of their effects on soils. Tannins may influence bioavailability and toxicity of metals by forming complexes and by mediating redox reactions. We evaluated the affinity and stoichiometry of Al(III) for a gallotannin, pentagalloyl glucose and an ellagitannin, oenothin B, using spectrophotometric titration and Job's method. The 280 nm absorbance band of the phenolics was shifted to 330 nm upon addition of Al(III) at pH 6 or pH 4 but absorbance was much weaker at the lower pH. Al(III) formed 2:1 complexes with apparent formation constants (Kf) of 1011 M⁻² with both tannins at pH 6, and 1:1 complexes, Kf 105 M⁻¹, at pH 4. The characterization of reactions between metals and well characterized tannins will lead to better understandings of the role tannins may play in plant nutrient cycling, detoxification of heavy metals, and water quality.

AGFD 140 Metal resistance and uptake capacity of edible mushroom: *Hypsizygus ulmarius* Gopal Coimbatore, gopal.coimbatore@tiehh.ttu.edu; Rajesh Babu Dandamudi; Meera Pandey; Nageshwara G Rao The Institute of Environmental and Human Health, Texas Tech Univ., Lubbock TX 79416, US Dept. of Chemistry, Sri Sathya Sai Institute of Higher Learning, Prashanti Nilayam Andhra Pradesh 515134, India Mushroom Lab, Indian Institute of Horticultural Research, Bangalore Karnataka 560089, India The fruiting bodies of mushrooms are characterized by a high level of well assimilated mineral constituents. We explored the use of mushrooms as functional foods, and as nutrient supplements. In the present work we explored the metal uptake capacity of *H. ulmarius*, commonly known as elm oyster mushroom, by cultivating it on artificially enriched substrates with different essential minerals like Fe, Cu, Mn and Mg. All the fruiting bodies were dried in tray drier, powdered, and acid digested in a microwave digester and analysed using ICP-AES. All the analysis was done in triplicate and compared to that of the control. The results showed that *H. ulmarius* has excellent uptake capacities of iron and copper and was resistant to manganese and magnesium uptake. The addition of calcium chloride had a dose dependent increase on the yield. Our study showed that mushrooms can be enriched with essential minerals and can be used as functional foods.

AGFD 141 Analysis of differential proteins in amaranth roots under water stress Ana P Barba de la Rosa, apbarba@ipicyt.edu.mx; Jose A Huerta-Ocampo; María F León-Galván; Lizeth B Ortega-Cruz; Alberto Barrera-Pacheco; Antonio De León-Rodríguez; Guillermo Mendoza-Hernández Molecular Biology, Institute for Scientific and Technological Research at San Luis Potosi, Mexico Biochemistry, National Autonomous Univ. of Mexico, Amaranth is a plant that is naturally resistant to water and salinity

stress. The aim of this work was to analyse the changes on protein expression in amaranth roots when the plant was subjected to water stress. Two-dimensional gel electrophoresis patterns of roots were analyzed. More than 500 spots were reproducibly detected from digital image analysis on Sypro-Ruby stained gels in the pH range 4-7. About 15 differentially expressed proteins analysed by LC/ESI-MS/MS were successfully identified. Among the identified proteins were chaperonins, a group of small Heat Shock Proteins, enzymes related to the secondary metabolism as Isoflavone reductase and Caffeic acid 3-O-methyltransferase, and enzymes related to ROS protection as Superoxide Dismutase. Acknowledgments: To 6th Framework Programme, AMARANTH:FUTURE-FOOD, Contract No. 032263.

AGFD 142 Cloning of a novel Zn-Fg transcription factor involved in abiotic stress in amaranth leaves Ana P Barba de la Rosa, aparba@ipicyt.edu.mx; Hugo S Aguilar-Hernández; Maria F León-Galván; Leticia Santos Antonio De León-Rodríguez; Alberto Barrera-Pacheco Eduardo Espitia-Rangel; Ramon G Guevara-González. Molecular Biology, Inst. for Scientific and Technolog. Research at San Luis Potosi, Mexico Campus Bajío, Instituto Nacional de Investigaciones Forestales, Agrícolas y Pecuarias, Celaya Guanajuato, Mexico CA de Ingeniería de Biosistemas, Facultad de Ingeniería, Universidad Autónoma de Querétaro, Querétaro, Mexico Amaranth is an ancient crop that produces seeds of high nutritive and nutraceutical quality. In addition the plant is tolerant to several abiotic stresses. We analyzed the differential transcripts in amaranth leaves when the plants are subjected to high concentrations of calcium using the suppression subtractive hybridization (SSH) technique. SSH libraries generated 420 up-regulated unigenes and 199 down-regulated unigenes. Among up-regulated transcripts, a clone containing the motif of C3HC4-type RING zinc family was cloned and characterized. The identification of a novel putative zinc-finger protein among other novel proteins such as the wall associated kinase involved in the stress-response in amaranth leaves, could be a source of new candidate genes to improve the abiotic stress tolerance of commercial crops. Acknowledgments: This work was supported by the 6th Framework Programme, Amaranth Future Food, Contract. 032263.

AGFD 143 Engineering and metabolic regulation of vitamin C biosynthesis in plants Lei Zhang, ellenstonesh@gmail.com; Kexuan Tang; Wansheng Chen Dept. of Pharmacognosy, Secondary Medical Univ., Shanghai China Dept. of Plant Sciences, Univ. of California Davis, Shanghai China Plant Biotechnology Res. Ctr., School of Agriculture and Biology, Fudan-SJTU-Nottingham Plant Biotechnology R&D Center, Shanghai Jiao Tong Univ., Shanghai China Dept. of Pharmacy, Changzheng Hospital, Second Military Medical Univ., Shanghai China Vitamin C (AsA) is the major soluble antioxidant found in plants and is also an essential component of human nutrition. Pressures such as commercial competition and environmental concerns make it urgent to find a new way for industrial production of plant-derived AsA. Here we report on enhancing plant AsA content by metabolic engineering in *Arabidopsis thaliana*. Six comprehensive strategies were proposed including overcoming the rate limiting steps in the biosynthetic pathway, inhibiting AsA degradation or reducing catabolism, promoting recycling, specific localization of the key enzyme to the sub-cellular compartment, promoting energy metabolism to optimize metabolites productivity and multiple-genes co-transformation based on Cre/Lox assembly and transformation vector system were utilized to development plant AsA metabolic engineering, aiming at boosting AsA production. The existing and potential achievements in increasing AsA production would present a better understanding of the mechanisms internal and external to plants that control AsA accumulation and provide opportunity for enhancing nutritional quality & stress tolerance of crop plants.

AGFD 144 Application of Shiitake mushroom extract to enhance the growth of lactic acid bacteria and bifidobacteria Osman Hassan, oahassan@ncat.edu; Danfeng Song; Salam A. Ibrahim; Omoanghe S. Isikhuemhen; Abolghasem Shahbazi; Amer Abughazaleha; Saeed A. Hayek Family and Consumer Sciences, North Carolina A&T State Univ., Greensboro Natural Resources, North Carolina A&T State Univ., Greensboro Animal Science, Food & Nutrition, Southern Illinois Univ., Carbondale The objective of this study was to investigate the effect of a Shiitake mushroom extract on the growth of lactic acid bacteria and bifidobacteria. Varying concentrations (0, 1, 2, and 4%) of the extract were used to test the viability of *Lactobacillus reuteri* CF2-7F, *L. reuteri* DMS20016, *Bifidobacterium breve* (ATCC 15701) and *B. adolescentis* (ATCC 15704). Bacterial growth was monitored by measuring turbidity, changes in pH values and titratable acidity. The growth of all tested strains was significantly enhanced in the presence of mushroom extract ($p < 0.05$). CF2-7F grown on MRS medium with 4% Shiitake mushroom extract had the highest log cfu/ml compared to the control during 8 hour incubation. Results suggest the potential use of Shiitake mushroom extract as a natural additive to probiotic food products to improve the growth of lactic acid bacteria and bifidobacteria.

AGFD 145 Synthesis of lycorine analogs and activity against *Flavobacterium columnare* Agnes M. Rimando, agnes.rimando@ars.usda.gov; Change-Xia Tan Kevin K. Schrader; Cassia S. Mizuno Agricultural Research Service, U.S. Dept. of Agriculture, Univ. MS College of Chemical Engineering and Materials Science, Zhejiang Univ. of Technology, Univ. MS The bacterial pathogen *Flavobacterium columnare* causes columnaris disease, a world-wide bacterial fish disease that causes heavy economic losses to the aquaculture industry. Lycorine, a pyrrolo[de]phenanthridine ring-type alkaloid, was previously shown to possess strong antibacterial activity towards two genomovars of *F. columnare*, ALM-00-173 and BioMed. In a continuing effort to discover natural product and natural product-based compounds for the control of columnaris disease in channel catfish (*Ictalurus punctatus*), 17 lycorine analogs were synthesized by introducing diversity at the hydroxyl groups of lycorine, and then evaluated for activity against the two *F. columnare* genomovars. The lycorine analog (1S,2S,3a1S,12bS)-2,3a1,4,5,7,12b-hexahydro-1H-[1,3]dioxolo[4,5-j]pyrrolo[3,2,1-de]phenanthridine-1,2-diyl bis(o-tolylcarbamate) had the strongest inhibitory activity towards both *F. columnare* ALM-00-173 and BioMed, with a 24-h IC50 of 3.0 ± 1.3 mg/L and 3.9 ± 2.2 mg/L, respectively, and a MIC of 5.5 ± 0 mg/L for both isolates.

AGFD 146 Influence of technological processing on the quality attributes and storage stability of small pelagic fish Hany Aly Abogharbia, amani_dawa@hotmail.com; Aly Aly Abdelnaby; Elsayed Moh Abotor Dept. of Food Sci & Tech., Alexandria Univ., Egypt Small pelagic fish were used in this investigation in order to increase its industrial utilization. This fish deteriorates rapidly because of its small size, fragile body, high fat content and high activity of gut enzymes resulting in huge amount of waste from this fish every year. In this study different products were prepared from pelagic fish such as hot smoked fish (as a snack/appetizer) and a powder from smoked pelagic fish. The latter product was technologically applied / incorporated as a natural flavoring agent into different popular products such as kofta, pizza paste, mayonnaise, tahina and potato chips. The degree of its consumer acceptability was tested and evaluated. Most of these products were highly accepted because of the unique and pleasant flavor of smoked fish. The optimum conditions required to

prepare these products are also described in this study. The influence of processing and storage conditions on the oxidative stability and microbiological counts was studied and tabulated.

AGFD 147 Application of proteomics to understand meat attribute traits in slow and fast growing chickens

Phodchane Phongpangan, tik@uga.edu, Samuel E. Aggrey; Arthur Grider Louise Wicker Jake Mulligan Dept. of Food Sci & Tech., Univ. of Georgia, Athens GA Dept. of Poultry Science, Univ. of Georgia, Athens Foods and Nutrition, Univ. of Georgia, Athens Growth rate (GR) influences chicken meat characteristics. Water holding capacity (WHC) is an important meat quality parameter. The objective of this study was to find protein markers that are associated with fast- and slow-GR and low- and high-WHC from chicken muscle. Water soluble protein (WSP) and non-WSP extracts were prepared from breast muscle of chickens that differed in GR or WHC. Soluble extracts were separated by two-dimensional gelelectrophoresis (2DE). A total of 22 selected protein spots were excised and analyzed by in-gel tryptic digestion and MALDI-TOF mass spectrometry. The mass spectra of 20 protein spots significantly matched (protein score > 83; p<0.05) the NCBI on-line database. In non-WSP, there were unique proteins that were present only in fast GR muscle: gi|118099530; gi|20664362; gi|71895043; gi|114794125; gi|297343122; gi|71895043. This information could be used to identify functional candidate genes for meat quality traits in chickens.

AGFD 148 Effect of enzymatic randomization on positional distribution and stability of menhaden oil and seal

blubber oil Jiankang Wang, jw2201@mun.ca; Fereidoon Shahidi Dept. of Biology, Memorial Univ. of Newfoundland, St Johns NL Canada Dept. of Biochemistry, Memorial Univ. of Newfoundland, St Johns NL, Canada In an effort to investigate the effects of positional distribution and tocopherol content on oxidative stability of marine oils, namely menhaden oil and seal blubber oil, Novozyme 435 was used as a random biocatalyst. Positional distribution of fatty acids was determined using gas chromatography. As alpha-tocopherol was lost during randomization, its content was adjusted to the level prior to the process in order to eliminate this effect on oxidative stability of oils tested. Conjugated dienes (CD) and thiobarbituric acid reactive substances (TBARS) were determined to assess the oxidative stability of randomized and original oils. Results showed that the polyunsaturated fatty acids were distributed predominantly at terminal positions in randomized menhaden oil while they were distributed more evenly among all positions in enzymatically randomized seal blubber oil, compared to their unrandomized counterparts. Results of CD and TBARS values indicated that randomized menhaden oil was more stable than that of the original oil while randomized seal blubber oil was more vulnerable to oxidation compared to its counterpart. Changes of oxidative stability after randomization were mainly due to positional redistribution of fatty acids, especially the polyunsaturated types.

AGFD 149 Improvement of the oral bioavailability of curcumin using polymer micelle- and lipid-based delivery

systems Hailong Yu hailong@eden.rutgers.edu.; Qingrong Huang Dept. of Food Science, Rutgers, the State Univ. of New Jersey, New Brunswick Curcumin is a well-known nutraceutical with anti-inflammatory, anti-cancer and antioxidant activities. However, the low bioavailability of curcumin affects its bioactivity. Using Caco-2 cell monolayers model, our studies revealed fast absorption rate of solubilized curcumin, suggesting that solubilization limited the absorption of curcumin. To maximize the solubilization of curcumin, we developed polymer micelle- and lipid-based delivery systems. Polymer micelles formed by modified starch and novel modified epsilon polylysine were able to solubilize curcumin and enhance its in vitro bioactivities. Meanwhile, lipid-based formulations, after lipolysis, were able to turn into micelle aqueous solutions and solubilize curcumin. Lipolysis of medium chain triglyceride (MCT) solubilized more curcumin than coconut, canola and corn oils. Meanwhile, Span20 was shown as the most effective additive to increase the curcumin solubility in MCT. Nanoemulsion systems using curcumin in MCT-Span20 as the oil phase represents more complicated lipid-based formulations and will also be discussed in the presentation.

AGFD 150 High-solids biphasic H₂O-CO₂ pretreatment using single and dual temperature stages

Jeremy S. Luterbacher jeremy.luterbacher@gmail.com, Jefferson W. Tester; Larry P. Walker Dept. of Chemical and Biomolecular Engineering, Cornell Univ., Ithaca NY Dept. of Biological and Environmental Engineering, Cornell Univ., Ithaca NY Our research has demonstrated that high-pressure (200 bar) and high-solids biphasic CO₂-H₂O pretreatment of lignocellulosic biomass produces high sugar yields without the addition of chemical catalysts. Initial results were obtained with a 24-ml reactor and a single temperature stage with <1mm particles. To manage heat and mass transfer limitations and study larger particles (<1cm), a customized 1L stirred reactor was used to pretreat 40 wt% solids mixed hardwood, switchgrass, mixed perennial grasses and corn stover with single and dual temperature stages. Glucose, hemicellulose sugars, furfural and 5-HMF yields were determined after performing enzymatic hydrolysis on the resulting solids. Hardwood pretreatment at 170°C for 60 min in the small reactor gave glucose yields of 73%, while 83% yields were obtained in the stirred reactor at 210°C for 16 min followed by 160°C for 60 min. The effects of biomass species, dual temperature stages, residence times and particle size are evaluated.

AGFD 151 Effect of fertilizer application and irrigation on agronomic characters of *Andrographis paniculata*

(Burm.f.) Wall. ex Nees var. *paniculata* Sudeepa Sugathadasa sudeepabmari@yahoo.com, Radhika Samarasekera; Gamini Pushpakumara Dept. of Botany, Bandaranaike Memorial Ayurvedic Research Institute, Nawinna, Maharagama Western, Sri Lanka Herbal Technology Section, Industrial Technology Institute, Colombo, Sri Lanka Dept. of Crop Science, Faculty of Agriculture, Univ. of Peradeniya, Peradeniya, Sri Lanka *Andrographis paniculata* (Burm.f.) Wall. ex Nees var. *paniculata* (Acanthaceae) is an indigenous species to India and Sri Lanka. The entire plant is used in Ayurvedic medical system. There is no previous research on effect of cultivation and growth conditions of bioactive compounds. The objective of this study was to identify effect of fertilizer and irrigation treatments on agronomic characters and bioactive compounds of *A. paniculata*. Experiment was carried out in wet (site 1) and the dry (site 2) zones in Sri Lanka. Factorial combination of three fertilizer treatments and two irrigation methods were applied and split plot design was used. The results highlighted that there is a significant effect on growth, composition of plant parts and bioactive compounds of two sites and was due to the combined effect of both fertilizer and irrigation.

AGFD 152 Antioxidant polyphenols from maple syrup

Mamdouh M. Abou-Zaid, mabouzai@nrcan.gc.ca, Great Lakes Forestry Centre, Natural Resources Canada, Canadian Forest Service, Saut Ste. Marie Ontario Canada The flora of Canadian forests is a rich source

of bioactive natural products. Maples (*Acer* spp., family Aceraceae) are among the most important hardwood species in North America. There are approximately 160 known maple species worldwide, and several are native to eastern Canada. Syrup is made from sap which the tree produces in great abundance in late winter, when daytime temperatures exceed the freezing point and nighttime temperatures fall below it. HPLC chromatograms of maple syrup are dominated by proanthocyanidins, chlorogenic acid and quercetin 3-O-rhamnoside. This presentation describes on-going research involving the isolation, purification and structure elucidation of antioxidant-active compounds from maple syrup, and considers their role in health promotion and disease prevention. Among the compounds of interest found in maple syrup are simple phenolics, polyphenols, and flavonoids. The objective of this presentation is to review phytochemicals derived from maple syrup in relation to health promotion and disease prevention.

AGFD 153 Opening new doors: Agave syrup Mercedes G. López, mlopez@ira.cinvestav.mx; Erika Mellado-Mojica Araceli M. Vera-Guzmán Biotechnology and Biochemistry, Centro de Investigación y de Estudios Avanzados, Irapuato Guanajuato Mexico Unidad Oaxaca, CIIDIR-IPN, Oaxaca Oaxaca Mexico Agaves are a good source of carbohydrates, mainly fructans and syrup. Agave syrups are nowadays highly desirable, since they can be placed in the market as sugar substitutes with a low glycemic index. But, are they good or bad? The chemical composition of 12 Agave syrup samples and some commercial syrup (honeybee and sugar cane) were used as controls. pH, oBrix, TLC, HPAEC, and sweetness were done. The pH of Agave syrups range between 3.65-4.98 and oBrix varied from 72.71 to 79.33. TLC showed overall sugar profiles, honey Bees presented very consistent TLC patterns, however, Agave syrup patterns varied widely among them, some presented only fructose, other short -DP fructans and a few showed long-DP fructans. On the other hand, by HPAEC it was possible to quantify the presence of neokestose, kestose, nystose, and DP=5 in most Agave syrup samples. Finally, Agave samples were tasted and compared with sucrose, most Agave samples were sweeter than sucrose, mainly those with short -DP. All results will be presented in detail. Based on those results we can conclude that some Agave syrups can be used as sweeteners in many food products, and that their addition will present a plus over other sugar substitutes, since they might have an impact in obesity and diabetes.

AGFD 154 Chromatographic analysis of natural sweeteners: UPLC applications for the analysis of food and beverage products Christopher Hudalla, chris_hudalla@waters.com; Pamela Iraneta Paul Smith; Dan Walsh Kevin Wyndham Chemistry Organization R & D, Waters Corporation, Milford MA The chromatographic analysis of carbohydrates has become a valuable tool in many areas of research. For the food & beverage industry, the identification and quantitation of mono- and disaccharides present in raw materials and finished products is crucial. The addition of other additives, more complex sugars, sugar alcohols, artificial sweeteners and salts can result in complex mixtures which are difficult to analyze. Chromatographic separations for these applications are often hindered by multiple problems, including the mutarotation of sugar anomers, on-column formation of Schiff bases, chromatographic interferences from sample matrices, and shortened column lifetime. Here, we present research on a commercially-available 1.7µm particle amide column. The versatility and robust nature of this stationary phase enables fast, efficient separations of many simple and complex natural sweeteners. The use of ethylene-bridged hybrid (BEH) particles allows for extended column lifetimes, ELSD and MS gradient compatibility and removal of salt and many matrix interferences.

AGFD 155 Maple sap and syrup are a rich sources of abscisic acid and polyphenols with potential benefits to health Yves Desjardins, Yves.desjardins@fsaa.ulaval.ca, Inst. Nutraceutical & Funct. Foods, Laval Univ., Québec City Québec Canada For centuries maple sap and syrup have been a staple of North-American native people and are consumed now-a-days throughout the world as edulcoration produce and natural sweeteners, appreciated for their quality and delicate taste. Maple sap is collected in the Spring when freeze/thaw cycles causes the sweet sap to rise in the tree and flow from especially made taps in the trunk for collection. The sap is boiled to concentrate the sugar and forms a rich 66°Brix syrup. Apart from sugar, the natural sap contains minerals, oligosaccharides, some proteins, polyphenols and phytohormones. We hereby present original results on the content of maple sap and syrup in phytohormones and especially in abscisic acid (ABA), in ABA-conjugates and its metabolites. We show that this sesquiterpene can be traced in large concentration in both the sap and the syrup. The metabolites thus resist heat and technological process leading to the consumable produce. Moreover, the largest form of sesquiterpene in the sap and syrup were phaseic acid and dihydrophaseic acid accounting for almost 90 % of this class of molecules while ABA and its 7'-OH form accounted for close to 10 % of this terpenoid in the sap and syrup. Recently ABA and their metabolites have been suggested to act as autocrine cytokine molecules in human granulocytes and were shown to stimulate the release of insulin by pancreatic Langerhans Islets (Guri et al. 2007, Clin. Nutr. 26:107-116). The high titer of ABA in maple products may explain why they are better tolerated by those suffering from diabetes and metabolic disorders than those consuming other sugars.

AGFD 156 Commercial sweeteners: Comparison of their effect on cellular antioxidant capacity and glucose uptake Joe Vinson, vinson@scranton.edu; Melissa McHale Dept. of Chemistry, Univ. of Scranton, US Normal individuals and especially those with Type 2 Diabetes or faced with obesity, often seek to decrease their sugar intake by consuming either natural or artificial alternative sweeteners to sugar. Also desirable is a sweetener that can help decrease the absorption of additional dietary sugars when taken simultaneously. Consumption of high levels of dietary simple sugars can accentuate "oxidative stress" due to toxic free radicals being produced. Our lab has developed a unique cell model to simulate in vivo conditions of glucose absorption which consists of a high glucose cell medium and epithelial cells. We have compared 3 commercial sweeteners; Splenda, Truvia and Susta in this model. All sweeteners lowered glucose uptake and increased cellular antioxidant capacity but Susta was superior presumably due its fiber and antioxidant content. In a separate experiment the fiber alone or antioxidants alone from Susta were beneficial but the combination was most effective

AGFD 157 Further insights into the phenolic constituents present in maple syrup Liya Li, liya_li@mail.uri.edu Navindra P. Seeram Biomedical and Pharmaceutical Sciences, Bioactive Botanical Research Laboratory, Univ. of Rhode Island, Kingston RI Maple syrup is a natural sweetener that contains phenolic compounds. We recently reported on the isolation and identification of twenty-three phenolic compounds from a Canadian maple syrup butanol extract (MS-BuOH) that included lignans, coumarins, a stilbene and phenolic acid derivatives. Here, we focused our isolation efforts on an ethyl acetate extract of Canadian maple syrup (MS-EtOAc). Twenty phenolics were obtained including two new compounds, 2,3-dihydroxy -1-(3,4-dihydroxyphenyl)-1 propanone and 5-(3',4'-

dimethoxyphenyl)-3-hydroxy-3-(4'-hydroxy-3'-methoxybenzyl)-4-hydroxymethyl-dihydrofuran-2-one. Despite common phenolic constituents present in both MS-BuOH and MS-EtOAc extracts, their overall phenolic profiles are quite different. This should be taken into account when different phenolic-enriched maple syrup extracts are being evaluated in various bioassays.

AGFD 158 HPLC determination of steviol glycosides in stevia sweeteners: An alternative to UV detection Deanna C Hurum deanna.hurum@dionex.com; Brian M De Borba ; Deepali Mohindra; Jeffrey S Rohrer Dionex Corporation, Sunnyvale CA
Extracts of Stevia rebaudiana (Bertoni) are gaining popularity as non-caloric sweeteners and have been commercialized as sugar substitutes. Many glycosides are present in the extract, with rebaudioside A of primary commercial interest. Due to the structural similarity of the glycosides, separation can be challenging. Using a tri-mode column, we developed an isocratic method for analysis of stevia extracts. The high volatility of the mobile phase made the method ideal for an aerosolizing detection technique, such as charged aerosol detection (CAD), following UV detection. This dual detection method was used to determine the relative proportion of glycosides in two commercial stevia-based sweeteners with a calibration range between 60-500 µg/mL. Retention time and peak area precisions had RSDs of < 0.1 and < 2.0, respectively for the two products. Detection sensitivity is improved for many impurity glycosides in stevia that do not strongly absorb in the UV, such as rebaudioside B.

AGFD 159 Evaluating sweet potato as an intervention food for preventing vitamin A deficiency Betty J Burri , betty.burri@ars.usda.gov Tami Turner Western Human Nutrition Res. Ctr., USDA, Davis CA Vitamin A deficiency (VAD) causes about 600,000 deaths/year. We evaluated orange-fleshed sweet potatoes (OFSP) carotenoid concentrations, bioaccessibility, and processing, to estimate the amount of OFSP needed to prevent VAD. This varies with age and sex, and with the amount of beta-carotene in the OFSP. Amounts ranged from 6 – 33 g/d (young child with marginal VA status) to 76 – 426 g/d (lactating woman with good status). These amounts can be eaten on a daily basis. To prevent VAD in the 208,100,000 people most at risk for it for one year is 2.1 – 11.7 million tonnes (2 – 11% of current world production). The most important factor influencing the effectiveness of sweet potato for preventing VAD, by far, is the variety used. Dietary fat is also important. We conclude that OFSP could prevent VAD in many food deficit countries—if OFSP were substituted for white, cream, yellow or purple sweet potatoes.

AGFD 160 Carotene and novel apocarotenoid concentrations in orange-fleshed Cucumis melo melons:
Determinations of beta-carotene bioaccessibility and bioavailability Matthew K Fleshman , fleshman.17@osu.edu Gene E Lester ; Ken M Riedl ; Steven J Schwartz ; Earl H Harrison . Dept. of Human Nutrition, Ohio State Univ., Columbus Ohio Kika de la Garza Subtropical Agricultural Res. Ctr., Agricultural Research Service - USDA, Weslaco Texas Dept. of Food Science & Technology, Ohio State Univ., Columbus Ohio Cantaloupe (Cucumis melo Reticulatus Group) and orange-fleshed honey dew (C. melo Inodorus Group) are excellent sources of β-carotene. We compared β-carotene concentrations from orange-fleshed honey dew and cantaloupe melons and determined β-carotene bioaccessibility/bioavailability, concentrations of novel β-apocarotenals, and the chromoplast structure of orange-fleshed honey dew. β-carotene and β-apocarotenal concentrations were determined by HPLC and/or HPLC-MS, bioaccessibility/bioavailability were determined by in vitro digestion and Caco-2 cell uptake, and chromoplast structure was determined by electron microscopy. The β-carotene concentrations in the orange-fleshed honey dew and cantaloupe averaged 243 and 176 µg/g dry weight, respectively. The bioaccessibility of β-carotene in orange-fleshed honey dew melons was 3.2±0.3 percent, bioavailability in Caco-2 cells was about 11%, and chromoplast structure was globular (as opposed to crystalline) in nature. We detected β-apo-8l-, β-apo-10l-, β-apo-12l-, β-apo-14l-carotenals and β-apo-13-carotenone in orange-fleshed melons. The bioaccessibility/bioavailability of β-Carotene from orange-fleshed melons was comparable to that from carrot (Dacus carota).

AGFD 161 Does vitamin D associate with Autism Spectrum Disorder? Yan-ping Lin , elppalin@gmail.com Pavel A. Aronov ; Jun Yang ; Judy Van de Water ; Paul Ashwood ; Bruce D. Hammock . Dept. of Entomology, Univ. of California, Davis, Stanford Univ.CA Dept. of Internal Medicine, School of Medicine, Univ. of California, Davis, UC Davis M.I. N. D. Institute, Univ. of California, Davis By food intake and synthesized due to the sunlight, sufficient vitamin D level is far more important than only maintaining the mineral content of bone, but also beneficial to various diseases. The apparent increase in the incident rate of ASD (Autism Spectrum Disorder) over the last 20 years may correspond to the lowered vitamin D levels and brings out a hot debated topic about vitamin D deficiency might be partly responsible for ASD. In this study the circulating levels of vitamin D and its major metabolites were simultaneously determined in serum of children with and without autism through an ultra-performance liquid chromatography (UPLC)-electrospray /tandem mass spectrometry (UPLC-MS/MS) method, which can distinguish D2 and D3 series of vitamin D and its major bioactive metabolites in a single experiment. This analytical method uses a liquid-liquid or solid-phase extraction of vitamin D metabolites in combination with Diels-Alder derivatization using the commercially available reagent 4-phenyl-1,2,4-triazoline-3,5-dione (PTAD) followed by UPLC-MS/MS analysis. This method provides rapid and simultaneous quantification of 1a,25-dihydroxyvitamin D3, 1a,25-dihydroxyvitamin D2, 25-hydroxyvitamin D3 and 25-hydroxyvitamin D2 in 400 µL of human serum with an LoQ (Limit of Quantification) of 25 pg/ml. The results of this study indicated that children with autism had lower levels of 25-hydroxyvitamin D and 1a,25-dihydroxyvitamin D than that of typical developing children. However, there were different circulating levels of distinguished D2 and D3 metabolites in autistic and healthy children. The presented study highlighted the different forms of vitamin D and suggested that sufficient supplement of vitamin D3 might help to protect children's health.

AGFD 162 Factors affecting apparent bioavailability of carotenoids and anthocyanins Beverly A Clevidence , Beverly.Clevidence@ars.usda.gov, Janet A Novotny ; David J Baer ; Steven J Britz ; Craig S Charron . Beltsville Human Nutrition Center, U.S. Dept. of Agriculture, Beltsville MD Studies of bioavailability facilitate understanding of the types and amounts of bioactive compounds from foods that become available to the body. Factors affecting carotenoid bioavailability include food matrix and dose level. Plasma lycopene concentrations, for example, do not increase in proportion to lycopene consumption as subjects consume higher doses. Additionally, consuming plant sterols can limit carotenoid absorption. Anthocyanins vary in structure, a determinant of their bioavailability. Following intake of anthocyanin-rich vegetables, acylated anthocyanins appear in circulation at lower concentrations than do non-acylated anthocyanins suggesting that these compounds are more poorly absorbed or more rapidly metabolized. Recoveries of

nonacylated vs acylated anthocyanins in urine were greater than four-fold for red cabbage and ten-fold for purple carrot. Thus, apparent absorption of acylated anthocyanin is lower than that of nonacylated anthocyanins; however, research is needed to clarify the fate of anthocyanin metabolic products and their potential role as health-promoting bioactive compounds.

AGFD 163 Bioavailability and efficacy of vitamins and provitamins in foods Mark Failla , failla.3@osu.edu, Human Nutrition, Ohio State Univ., Columbus Ohio The human diet has been estimated to contain 20,000 compounds including 13 vitamins that are required for growth, health and survival. As for all compounds present in foods, vitamins and provitamins must be released from the food matrix and delivered to tissues where they are utilized or stored until needed. The efficiency of transfer of vitamins/provitamins from foods to tissues is influenced by style of processing, physicochemical properties of the vitamin, other factors in the food/meal that may affect the efficiency of absorption and functionality of vitamins, as well as the nutritional and physiological status and genetics of the individual. Also, there are many non-essential, health-promoting compounds present in foods that interact with vitamins to promote health. Examples of such interactions will be discussed in support of the premise that a diverse, well balanced diet provides adequate amounts of vitamins for many individuals.

AGFD 164 Food processing and matrix affects bioavailability of carotenoids and folates Steven J Schwartz , schwartz.177@osu.edu, Dept. of Food Science, The Ohio State University, Columbus Many questions remain regarding bioavailability of carotenoids from food sources, effects of food processing, the influence of other dietary constituents (such as fat or fiber) and the role of food preparation. Additional research to define the relationships among carotenoid intake, absorption, tissue distribution, and biological effects is clearly necessary to address the potential health benefits. Among the many poorly understood complexities of carotenoids are the issues of cis-isomer formation in vivo, metabolism and interconversion of isomers and the biological effects or functions of specific isomers. At Ohio State Univ., we have conducted several pilot clinical studies to further our understanding of absorption, distribution, metabolism and clearance. Post-prandial experiments, monitoring newly absorbed carotenoids present within lipoprotein chylomicron fraction, provide another means to evaluate carotenoid absorption from specific food products or formulated meals. Post-prandial studies indicated that cis lycopene isomers present in differently processed tomato sauces were absorbed to a greater extent than all-trans lycopene. In addition, area under the curve measurements of lycopene isomers present in unique tomato varieties also indicated enhanced uptake of cis lycopene relative to all-trans. Recent interest in enhancing the bioavailability of lycopene has led researchers to consider techniques to induce isomerization. Although the bioavailability of lycopene is improved when isomerized to the cis configuration, additional research is needed to understand if a particular benefit or function is achieved by consumption of cis lycopene isomers relative to all trans. In addition to the carotenoids, specific examples of food processing operations that convert native folate to a more bioavailable form will be discussed.

AGFD 165 Nutritional and biological properties of extra virgin olive oil Edwin Frankel , enfrankel@ucdavis.edu, Food Science & Technology, Univ. of California Davis, The nutritional benefits generally recognized for consuming extra virgin olive oil (EVOO) are based on a large number of dietary trials of several international population and intervention studies. Unfortunately, many authors in this field used questionable analytical methods and commercial kits that were not validated scientifically to evaluate complex bioactive constituents of EVOO and lipid oxidation and decomposition products. Many questionable antiradical methods were commonly used to evaluate natural polyphenolic antioxidants, including an indirect method to determine low density lipoprotein (LDL) cholesterol. Extensive differences were observed in experimental design, diet control, population of different age and problems of compliance intervention, and questionable biomarkers of oxidative stress. Analyses in many nutritional studies were limited by the use of one-dimensional methods to evaluate multifunctional complex bioactive compounds and plasma lipid profiles by the common applications of commercial kits. Although EVOO contains polyphenolic compounds that exhibit significant in vitro antioxidant activity, much more research is needed to understand the absorption and in vivo activity. Many claims of in vivo human beneficial effects by consuming EVOO may be exaggerated. No distinction were apparently made between in vivo studies based on general health effects in large populations of human subjects, and smaller scale well-controlled feeding trials using either pure or mixtures of known phenolic constituents of EVOO. More reliable protocols and testing methods are needed to better validate the complex nutritional properties of EVOO.

AGFD 166 Quantification of the binding of curcumin to casein micelles in heated and unheated milk Saeed Rahimi Yazdi , srahimi@uoguelph.ca ; Milena Corredig .Dept. of Food Science, Univ. of Guelph, Ontario, Canada The interactions between curcumin, a bioactive polyphenolic compound derived from turmeric, and casein micelles were investigated by direct and quenching fluorescence spectroscopy. Casein micelles are avid binders of polyphenols and could be used as a natural nano-delivery system; however, little is known about the changes occurring with heating of milk. The binding constants were higher in heated compared to unheated skim milk; and a similar trend was observed with casein micelles in isolation. Curcumin binding to the casein micelles and whey proteins causes a blue shift in its fluorescence spectra, indicating that binding occurs in the hydrophobic regions of the proteins. Both direct and quenching experiments suggest that the increase in the binding of curcumin in heated milk is caused by a non specific binding to denatured whey proteins, both in solution and attached to the casein micelles.

AGFD 167 Controlling kinetics of phase separation in milk containing nutritionally significant beta- glucan concentrations Negin Sharafbafi , nsharafb@uoguelph.ca, Marcela Alexander ; Susan Tosh ; Milena Corredig . Dept. of Food Science, Univ. of Guelph, Ontario Canada Guelph Food Research Centre, Agriculture and Agri-Food Canada, Guelph Ontario Bioactivity of beta-glucans (BG) isolated from cereal grains depends on their molecular weight, the ratio of cellotriosyl to cellotetracosyl units, and concentration in final food product. FDA requires about 0.75 g/serving of BG to allow labelling food products as having cholesterol-lowering effect. At this concentration, BGs have shown thermodynamic incompatibility when mixed with milk proteins. The main objective of this work was to control kinetics of phase separation using rennet gelation of milk proteins, and create novel structures and textures with nutritionally significant concentration of BG. The key strategy was to induce gelation before addition of BG to milk. Different concentrations of high molecular weight oat BGs (0.15-0.9% (w/w)) were mixed with milk before and after addition of rennet. Rheological measurements clearly indicated that addition of BG after pre-renneting of milk could retard phase separating effect in mixtures containing = 0.3% (w/w) BG, which is required for its health claims.

AGFD 168 Interactions of milk proteins with tea polyphenols Sanaz Haratifar , sharatif@uoguelph.ca Gopinadhan Paliyath ; Milena Corredig . Food science, Univ. of Guelph, Canada Dept. of Plant Agriculture, Univ. of Guelph, Canada Polyphenols are recognized for their bioactivity as potent cell antioxidants. However, bioavailability of polyphenols is a key factor for their biological functions in vivo. Few reports are available on the effects of polyphenols when present in milk. Also, very few studies have been conducted to understand the physicochemical interactions occurring between casein micelles and polyphenols as well as their processing and biological significance. In this study, the molecular details of the interactions between tea polyphenols and milk proteins were quantified, and the effect of the interactions of different concentrations of tea polyphenols on rennet induced aggregation of milk was studied. The results showed the formation of catechin-casein micelles not only delayed the gelling point of milk, but also affected its structure formation. The biological efficacy of the catechin-milk protein complexes was also tested using HT-29 cancer cells, which showed that these complexes still caused a decrease in the proliferation of HT-29 cells.

AGFD 169 Characterization of antihypertensive peptides presents in amaranth seed storage proteins Ana P Barba de la Rosa , apbarba@ipicyt.edu.mx, Adriana Barba Montoya ; Pedro Martínez-Cuevas ; Blanca Hernández-Ledesma ; María F León-Galván ; Antonio De León-Rodríguez ; Carmen González . Molecular Biology, Institute for Scientific and Technological Research at San Luis Potosi, San Luis Potosi, Mexico Faculty of Chemistry, Universidad Autonoma de San Luis Potosi Mexico Instituto de Fermentaciones Industriales (CSIC), Madrid Spain The tryptic hydrolysis of amaranth proteins generates , among other peptides, angiotensin converting enzyme (ACE) inhibitory. ACE converts angiotensin I (AngI) into Ang II, but is also responsible of the degradation of bradykinin (BK). In contrast to Ang II, BK stimulates vasodilation modulated through endothelial nitric oxide (NO) production. An IC₅₀ value of 200 µg/ml was measured for TDG inhibition of ACE. TDGs stimulated endothelial NO production in coronary endothelial cells (CEC) by 52% compared with the control. The effects of TDGs were comparable to those of BK and Captopril, both used as positive controls of NO production. Consistent with these effects, TDGs induced, in a dose-dependent manner, endothelial NO-dependent vasodilation in isolated rat aortic rings. These results suggest that TDGs induce endothelial NO production and consequent vasodilation through their ACEi activity. Amaranth TDGs have a high potential as nutraceutical food in prevention of cardiovascular diseases. Acknowledgments: To 6th Framework Programme, AMARANTH:FUTURE-Food, Contract No. 032263.

AGFD 170 Release of bioactive peptides from flaxseed (*Linum usitatissimum* L.) protein under static and dynamic simulated gastrointestinal digestion Harsha K. Marambe , hamarambe@yahoo.com, Phyllis J. Shand ; Janitha P. D. Wanasundara . Dept. of Food and Bioproduct Sciences, Univ. of Saskatchewan, Canada Saskatoon Research Centre, Agriculture and Agri-Food Canada, Saskatoon Canada The ability of flaxseed (*Linum usitatissimum* L.) proteins to generate peptides with angiotensin 1- converting enzyme inhibitory (ACEI) and hydroxyl radical (OH•) scavenging activities were determined under in vitro gastrointestinal (GI) digestion using static and dynamic models. In the dynamic model, continuous removal of <1 kDa molecules in the intestinal phase mimicked the small intestinal absorption. ACEI activity was detected in the gastric (IC₅₀: 0.16 mg N/mL) and GI digests of both models. The final digest of the static model had IC₅₀ of 0.39 mg N/mL. The IC₅₀ of retained and absorbable fractions of the dynamic model were 0.05 mg N/mL and 0.04 mg N/mL respectively. Only the GI digest of the static model exhibited OH• scavenging activity (IC₅₀: 0.4 mg N/mL) suggesting that the release of bioactive peptides is dependent on the type of digestion model used. Peptides of 0.5-1 kDa were contributing mostly to the ACEI activity of the absorbable fraction of flaxseed protein GI digest.

AGFD 171 Fatty acids, tocopherols and polyphenolic compositions and antioxidant activities of heartnut (*Juglans ailanthifolia* var. *cordiformis*) Rong Tsao , rong.cao@agr.gc.ca; Li Li ; Hongyan Li ; Tao Wu ; John K. G. Kramer . Agriculture & Agri-Food Canada, Guelph Food Research Centre, Ontario Canada Dept. of Chemistry, Chanchun Teachers College, Changchun Jilin, China The heartnut (*Juglans ailanthifolia* var. *cordiformis*) is a unique heart-shaped tree nut grown in the Great Lakes region in Ontario, Canada. The heartnuts were higher in polyunsaturated (linoleic, 71% vs 59%; and linolenic acids, 14% vs 10%) and lower in saturated (palmitic, 3% vs 6%; and stearic, 1% vs 3%) and monounsaturated (oleic, 13% vs 16%) fatty acids as compare to those in the Persian walnuts. γ -Tocopherol was the predominant vitamin E isomer (206 mg/g), followed by d- and a- and b-tocopherols. The total phenolic contents averaged 2400 and 7500 mg gallic acid equivalent /g for the heartnuts and the Persian walnuts, respectively. LC-ESI-MS studies showed that ellagic acid derivatives were the major free and bound phenolics. These components were found to contribute to the total antioxidant activities measured using different in vitro systems.

AGFD 172 Colored avocado seed extract with radical scavenging and anti-carcinogenic activity Deepti Dabas , dud150@psu.edu, Gregory R. Ziegler ; Ryan J. Elias ; Joshua D. Lambert . Dept. of Food Science, Pennsylvania State Univ., Univ. Park Natural colorants are increasingly sought due to consumer concerns about artificial additives. Avocado (*Persea americana*) seed when crushed with water develops an orange color in a time-dependent manner with most of the color production occurring in the first twenty minutes. Heat treatment of the seed prevented color development, whereas addition of exogenous polyphenol oxidase (PPO) restored color development. The colored extract was found, by electron paramagnetic resonance spectroscopy, to have radical scavenging activity (EC₅₀ = 42 µg/ml), and to concentration-dependently reduce lipid-hydroperoxide formation in oil-in-water emulsions stored at 37 °C. The extract when tested for in vitro cytotoxicity against four human cancer cell lines (HT-29, H-1299, MCF-7 and LnCAP), displayed a dose dependent inhibition with IC₅₀ values of 19.1 – 132.2 µg/ml. These results suggest that the avocado seed may have a role as a new natural colorant, which may impart additional functionality such as antioxidant and anti-carcinogenic activity.

AGFD 173 Evaluation of phenolic-enriched maple syrup extracts for inhibition of carbohydrate hydrolyzing enzymes relevant to type-2 diabetes management Emmanouil Apostolidis , nseeram@uri.edu.; Liya Li ; Chong Lee ; Navindra P. Seeram . Univ. of Rhode Island, Food Science and Nutrition Res. Ctr., Dept. of Nutrition and Food Sciences, Kingston RI Biomedical and Pharmaceutical Sciences, Univ. of Rhode Island, Bioactive Botanical Research Laboratory, Kingston RI Maple syrup is a premium natural sweetener that contains phenolic compounds beyond its natural sucrose content. In this study, three phenolic-enriched Canadian maple syrup extracts were evaluated for their ability to inhibit carbohydrate hydrolyzing enzymes (α -glucosidase and α -amylase) activity in vitro. The maple syrup

extracts were prepared and standardized to their phenolic contents based on a dry weight (DW) basis and included ethyl acetate (MS-EtOAc; 340 mg/g DW), methanol (MS-MeOH; 96 mg/g DW) and butanol (MS-BuOH; 30 mg/g DW) extracts. All the tested extracts had a-glucosidase inhibitory activity. On a dry weight basis, the observed inhibitory activities correlated well ($r = -0.96$) with phenolic contents. MS-EtOAc had the highest inhibitory activity (IC₅₀ 318.36 μ g) followed by MS-MeOH and MS-BuOH with IC₅₀ values of 1389.44 and 2279.43 μ g respectively. However, on a phenolic content basis, the MS-BuOH had higher inhibitory activity (IC₅₀ 68.38 μ g phenolics) followed by MS-EtOAc and MS-MeOH with IC₅₀ values of 107.9 and 133.44 μ g phenolics, respectively. These results suggest that maple syrup extracts may have a phenolic dependent potential for type 2 diabetes management and their a-glucosidase inhibitory activities depend on their phenolic profile.

AGFD 174 Rheology of Agave syrup Araceli M. Vera-Guzmán , araverag@yahoo.com.mx, Mercedes G. López ; Laura V. Aquino-Gonzalez . Unidad Oaxaca, CIIDIR-IPN, Oaxaca, Mexico Biotechnology and Biochemistry, Centro de Investigación y de Estudios Avanzados, Irapuato Guanajuato 36821, Mexico Agave syrup, a natural product with high sweetener capacity, is obtained from cooking and concentrating the juice of Agave plants. Viscosity is one of the most significant physical chemical properties in determining the quality and acceptability of syrup. Knowledge of the rheology of Agave syrup is therefore necessary in its production, processing, and storage. The aim of the present study was to evaluate the viscosity of Agave syrup, over five temperatures. The viscosity of 10 Agave syrup samples as well as 2 honeybee and 2 sugar cane syrup were used as references. Samples were analyzed over a range of shear rates (1.0 - 100 s⁻¹) with five temperatures (10, 20, 40, 60, and 80°C) in an Anton Park rheometer MR301. In general, the viscosity curves of all samples exhibited a Newtonian behavior. The mean viscosity values of Agave syrup, sugar cane, and honeybee were 2.56 Pa s, 6.06 Pa s, and 10.47 Pa s, respectively, at 20°C and 10 s⁻¹. The viscosity value of Agave syrup was less than the values of the references. The viscosity of Agave Syrup (8.94 - 0.16 Pa s), sugar cane syrup (74.45 - 0.23 Pa s) and honeybee (109 - 0.09 Pa s) decreased with an increase in temperature (10 – 80°C). The viscosity of samples depended on the type of syrup and the temperature of the measurement.

AGFD 175 Availability of polyphenols in maple syrup subjected to in vitro gastrointestinal digestion and their antiproliferative effects on human colon cancer cell lines Antonio Gonzales-Sarrias , antoine_santo80@hotmail.com, Liya Li ; Pragati Nahar ; Navindra P. Seeram . Biomedical & Pharmaceutical Sci, Univ. of Rhode Island, Bioactive Botanical Research Laboratory, Kingston Canadian maple syrup (CMS) contains diverse phenolics that include lignans, coumarins, and phenolic acid derivatives. Several of these phenolic classes are known to show anticancer activities. The objectives of the current study were to: (i) determine the phenolic profile of CMS as affected by simulated in vitro digestion conditions; (ii) measure the cellular uptake and metabolism of the major CMS phenolics; (iii) evaluate the antiproliferative activity of CMS phenolic-enriched extracts against human colon cancer (HCT-116, Caco-2; HT-29) and normal colon (CCD-18Co) cells; (iv) unravel whether cell-cycle arrest and/or apoptosis are involved in their antiproliferative activity. The digestion process decreased the phenolic content of CMS compared to its initial, non-digested phenolic content. The colon cancer cell lines were incubated for 48 and 72 h duration with CMS extracts. In addition, cancer cells were incubated 4 h daily for 4 days or continuously for 24 h with bioaccessible fractions obtained after the digestion. Overall, CMS extracts inhibited the proliferation of the colon cancer cells, but not normal colon cells, to various degrees which may be attributed to their phenolic contents and profiles.

AGFD 176 Impact of symbiotic maple saps on the ecological balance of mice microflora Riadh Hammami , Riadh.Hammami@fsaa.ulaval.ca; Ismaïl Fliss . Nutraceuticals and Functional Foods Institute, STELA Dairy Reaserch Center, Quebec Canada This study was undertaken to evaluate the in vivo impact of new probiotic products based on liquid maple sap or its concentrate. Sap and concentrate, with or without inulin (2%) were inoculated with Bifidobacterium lactis Bb12 and Lactobacillus rhamnosus GG Valio at initial counts of 2.108 - 4.108 CFU/ml. The experiments started with antibiotic treatment (to induce microflora perturbation and/or diarrhea) followed by a combination of prebiotic and probiotics included in the maple sap or its concentrate for a week. All mice were allowed free access to food and water, monitored daily and weighted every three days. Enumerated caecal microbiota indicated an accelerated reestablishment of the ecological balance of mice microbiota after a daily administration of the combination of prebiotic and probiotics included in the maple sap and its concentrate.

AGFD 177 Evaluation of anti-inflammatory effects of a maple syrup polyphenol-enriched extract in LPS-stimulated murine macrophages Pragati P. Nahar , pragatipnaha@yahoo.com, Maureen V. Driscoll ; Liya Li ; Antonio Gonzales-Sarrias ; Angela Sliitt ; Navindra P. Seeram . Univ. of Rhode Island, Dept. of Biomedical and Pharmaceutical Sciences, Kingston RI Enhanced inflammation and presence of pro-inflammatory cytokines are associated with numerous chronic diseases such as type-2 diabetes mellitus, cardiovascular disease, Alzheimer's disease, and cancer. Nitric oxide (NO) and prostaglandin-E2 are pro-inflammatory mediators released from macrophages, which propagate inflammation through activation of nuclear factor-kappa B (NF-kB), and subsequent induction of inducible nitric oxide synthase and cyclooxygenase-1. An overwhelming amount of data indicates that dietary polyphenols, which comprise a large class of bioactive plant natural products, possess anti-inflammatory properties. Published studies examining maple syrup, a natural sweetener, have shown that it contains bioactive polyphenols. In the current study, the anti-inflammatory effect of a standardized polyphenolic-enriched Canadian maple syrup ethyl acetate extract (MS-EtOAc) was evaluated using lipopolysaccharide (LPS)-stimulated RAW 264.7 cultured murine macrophages. RAW 264.7 cells were cultured in appropriate media for 24 hours, co-treated with 10 ng/mL LPS and MS-EtOAc for 24 hours and then NO concentrations in media were quantified. LPS treatment increased media NO concentrations from 0 to 50-85 units. MS-EtOAc treatment decreased NO concentrations in LPS-treated cells, at concentrations ranging from 10-100 mg/mL. The effects of MS-EtOAc on both iNOS and COX-2 gene expression, protein expression, PGE-2 production, and NF-kB translocation are currently being evaluated to aid in elucidating its potential mechanism of anti-inflammatory action. Overall, MS-EtOAc effectively decreased LPS-induced NO elevation in RAW 264.7 cells.

AGFD 178 Analyzing the physiological functionalities of maple syrup from Canada Keiko Abe , aka7308@mail.ecc.u-tokyo.ac.jp, Yuki Watanabe ; Asuka Kamei ; Yuji Nakai . Dept. of Applied Biological Chemistry,, The Univ. of Tokyo and Kanagawa Academy of Science and Technology,, Bunkyo-ku and Kawasaki-shi Tokyo and Kanagawa Japan Kanagawa Academy of Science and Technology, Kawasaki-shi Kanagawa, Japan Kanagawa Academy of Science and Technology, Kawasaki-shi Kanagawa Japan Dept. of

Applied Biological Chemistry., The Univ. of Tokyo, Bunkyo-ku Tokyo, Japan Possible functionalities of maple syrup were investigated by feeding tests with rats. The values of the three liver function markers, ALT, AST and LDH, became significantly lower when rats were fed a standard AIN-93G diet containing 20% maple syrup from Canada than when they were fed the same diet containing an equal amount of sugar instead (control). This result suggests that maple syrup has a liver-protecting effect. DNA microarray study on hepatic gene expression showed that genes for amino acid catabolism were down-regulated. The amino acids in this case included Ser, His, Gln, Glu, Tyr, Asp and Ala. The possibility exists that the down-regulation leads to suppressing the ammonia release and then to protecting the liver function. This project was supported by CDAQ and ACAAF.

AGFD 179 Phenolic content and antioxidation capacity of hot-water extracts of sugar maple Biljana Bujanovic , bbujanovic@esf.edu.; Mangesh J. Goundalkar ; Liya Li ; Navindra P Seeram . Dept. of Paper and Bioprocess Engineering State Univ. of New York College of Environmental Science and Forestry, Syracuse NY Dept. of Biomedical and Pharmaceutical Sciences, College of Pharmacy, Univ. of Rhode Island, Kingston RI Hot-water extraction (HWE) is an attractive pretreatment in the development of lignocellulosic biorefineries. HWE of hardwoods mainly results in the extraction of hemicelluloses. Partial degradation and dissolution of lignin and extractives also occurs, generating phenolic compounds. Combined extractives and lignin degradation products in hot-water extracts should potentially afford material of high antioxidation capacity. In this study, the hot-water extracts of sugar maple were ultrafiltrated prior to sequential extraction with organic solvents. The organic extracts were analyzed for total phenolic content and antioxidation capacity. Identification of low-molecular weight compounds was performed by GC-MS. The retentate collected on the ultrafiltration membrane was analyzed for lignin and phenolic content prior to analyzing it for antioxidation capacity. Hot-water extracts of maple bark were also evaluated in this study. Understanding the nature of maple extracts will allow for expanding and integrating the lignocellulosic biorefinery with food and healthcare products

AGFD 180 Weather, climate, and phytonutrients Steven Britz , steven.britz@ars.usda.gov Food Components and Health Lab, U.S. Dept. of Agriculture, Beltsville MD Temperature, soil moisture, solar radiation and other environmental factors all can affect phytochemical composition in food crops, thus contributing to variability in nutritional value. To evaluate the impact of weather and potential future climate change on nutrients, a variety of compounds, including tocopherols, isoflavones, flavonols, phenolic acid esters, and phytosterols, were analyzed in seeds of soybean and rice and leaves of red clover, lettuce and kale following different conditions during growth and development in the field, in greenhouses, or in growth chambers. As an example, hot, dry weather dramatically increased vitamin E and decreased isoflavones in soybean seeds while also reducing yield. Moderate changes in crop management (i.e., later planting, later maturing lines) greatly reduced the impact of severe weather. Experiments in growth chambers indicated elevated atmospheric CO₂ at levels expected by the end of this century did not alter the effect of temperature on seed composition.

AGFD 181 Mechanisms and variability of intestinal absorption of beta-carotene in humans: Relationships to cholesterol absorption Earl H Harrison , harrison.304@osu.edu, Matthew K Fleshman ; Keary A Cope ; Janet A Novotny ; David J Baer ; Peter J Jones ; Ken M Riedl ; Steven J Schwartz . Dept. of Human Nutrition, Ohio State Univ., Columbus Ohio Human Nutrition Res. Ctr., Agricultural Research Service - USDA, Columbus Ohio NHLBI, National Institutes of Health, Bethesda Maryland, Nutrition & Functional Foods, Univ. of Manitoba, Winnipeg Manitoba, Canada Dept. of Food Science & Technology, Ohio State Univ., Columbus Experiments in vitro and in mice suggest that intestinal absorption β -carotene (β C) and cholesterol (CHL) share some molecular mechanisms. We determined β C absorption, its conversion to vitamin A, and CHL absorption in ten men who consumed a 5 mg dose of deuterium labeled β C (d8 β C); 6 subjects repeated the doses 2 months later. Enrichment of plasma chylomicrons with d8 β C and d4-retinyl esters (d4RE) was determined by HPLC-MS. CHL absorption was measured by the oral/IV dual isotope ratio method and ranged from 28-60%. Chylomicron d8 β C area under the curve (AUC) ranged from 0.05 to 0.41 μ M-hr and d4RE AUC ranged from 0.1 to 2.6 μ M-hr. For repeated treatment, the β C absorbed at the two times was correlated ($r=0.99$; $p<0.0001$) as was the conversion of d8 β C to d4RE ($r=0.77$; $p=0.08$), which ranged from 37-77%. There was no correlation between an individual's efficiencies of absorption of β C and of CHL ($r=-0.09$; $p=0.81$).

AGFD 182 USDA databases for dietary components in food and dietary supplements Joanne M. Holden , joanne.holden@ars.usda.gov; Janet M. Roseland ; Susan E. Gebhardt ; Karen W. Andrews ; Johanna T Dwyer . Nutrient Data Laboratory, U.S. Dept. of Agriculture, Beltsville Maryland Office of Dietary Supplements, National Institutes of Health, Bethesda MD, USDA develops and maintains current and accurate data for nutrients and other bioactive components in foods and dietary supplements. The USDA Nutrient Database for Standard Reference (SR23) contains data for more than 7600 foods and up to 140 dietary components. Since >50% of American adults report using a dietary supplement (DS) within the past thirty days, it is important to monitor actual composition of DS products as well as of foods. The Dietary Supplement Ingredient Database (DSID) is a federal initiative to provide analytical validation of ingredients in dietary supplements. The first release on vitamins and minerals in adult multivitamin/minerals (MVM), DSID-1, is derived from multiple lots of 115 representative adult MVMs which were chemically analyzed for nutrient content. DSID-1 is now available at <http://dietarysupplementdatabase.usda.nih.gov>. These analytically validated results can be used to track MVM supplement usage and to more accurately quantify total nutrient intake when used with the USDA SR23 for foods.

AGFD 183 Vitamin and mineral content in diced tomatoes processed using aseptic, hot fill and conventional canning Diane M. Barrett , dmbarrett@ucdavis.edu, Dept. of Food Science & Technology, Univ. of California, Davis Diced tomatoes are a high-value ingredient used in the manufacture of pizza and spaghetti sauces and salsa. California processors utilize three different methods of processing of diced tomatoes to stabilize them in bulk form for later formulation. In this project we compared the effects of aseptic, hot fill and canning processes on the overall quality, vitamin and mineral content of the final product. Tomatoes of the same cultivar and maturity, originating from the same grower field were processed on the same day at three different locations. Aseptically processed diced tomatoes had the greatest firmness, best retention of flavor volatiles, and relatively higher contents of vitamins and minerals.

AGFD 184 Comparing food-based interventions and supplements for preventing vitamin A deficiency Betty J Burri , betty.burri@ars.usda.gov, Western Human Nutrition Res. Ctr./USDA, Davis, Vitamin A deficiency (VAD) is the leading cause of preventable blindness in the world and a contributor to infant and maternal mortality in Asia and Africa. VAD is usually treated by feeding people at risk high-dose vitamin A supplements every 6 months. These programs are cost-effective, require little local labor or resources, and provide rapid relief from VAD. However, supplementation programs are associated with toxicity, price gouging, and irregular coverage of rural populations. For these reasons, and because growing foods rich in VA or its precursor beta-carotene (BC) can provide income and other nutrients to rural populations, several food-based interventions have been developed to prevent VAD. Current research efforts have focused on biofortifying staples such as maize, rice, and cassava with BC. However, excellent results have been obtained with foods naturally abundant in VA or BC, such as range-fleshed sweet potatoes, red palm oil, and small fish.

AGFD 185 Insecticide susceptibility levels among Asian citrus psyllid populations in Florida and evaluating the efficacy of selected insecticides against *Candidatus Liberibacter asiaticus* infected psyllid Siddharth Tiwari , stiwari@ufl.edu, Michael E Rogers ; Lukasz L Stelinski . Univ. of Florida, A two-year field study was conducted to evaluate insecticide resistance levels in the field populations of Asian citrus psyllid (ACP), *Diaphorina citri* Kuwayama. Five geographically discrete populations of adult ACP displayed a range of susceptibility levels against twelve tested insecticides. The highest level of resistance for adult ACP, as compared with a susceptible laboratory (LS) population, was found with imidacloprid with an LD50 resistance ratio (RR) of 35 in one population. Likewise, among nymph populations, indications of resistance were observed with carbaryl (RR = 2.9), chlorpyrifos (RR = 3.2), imidacloprid (RR = 2.3 and 3.8) and spinetoram (RR = 3.0 and 5.9). The presence of varying levels of insecticide resistance in adult and nymph populations was potentially explained by elevated levels of three major detoxifying enzymes: general esterase, glutathione S-transferase and cytochrome P450. These detoxifying enzymes are known to be upregulated in insecticide resistant populations. *Candidatus Liberibacter asiaticus*-infection (Las-infection) significantly increased the susceptibility of ACP adults to chlorpyrifos and spinetoram compared with uninfected counterparts and infected ACP were more susceptible to insecticides in general than uninfected ones. Correspondingly, general esterase, glutathione S-transferase and cytochrome P450 enzyme activities were significantly lower in Las-infected than uninfected ACP. The mortality of both uninfected and Las-infected ACP was higher at 37° than at 20, 22, or 24° C. Across all temperatures tested, mean percent mortality was higher in Las-infected than uninfected ACP.

AGFD 186 Presence of multiple kavalactone-yielding precursors in Kava roots Tevita N Voro , voro_t@usp.ac.fj, Mani Naiker ; Sunny Prasad . Dept. of Chemistry, Univ. of the South Pacific, Suva, Fiji Dept. of Pernot Richard New Zealand, Montana Brancott Winery, Marlborough, New Zealand Piper methysticum or Kava is an evergreen plant that is cultivated in the Pacific Region. An intoxicating drink is derived from its roots. Kavalactones are the active ingredients in Kava and we now wish to report the possible existence of kavalactone precursors. Our work on desmethoxyyangonin (X) and yangonin (Y) has demonstrated that kavalactones are regenerated when lactone-devoid extracts are subjected to hydrolysis. The results, at least for the roots, suggest the existence of kavalactone precursors.

AGFD 187 Persistent halogenated compounds in aquaculture environments of South China: Implications for health risk to global consumers via fish consumption Eddy Y Zeng , eddyzeng@gig.ac.cn Huan-Yun Yu ; Ying Guo ; Bao-Zhong Zhang . State Key Laboratory of Organic Geochemistry, Guangzhou Institute of Geochemistry, China Graduate School, Chinese Academy of Sciences, Beijing China Consumption of aquatic products, particularly fish, has been shown to be a major route of human exposure to PHCs. As the largest fishery producer and exporter in the world, China plays a decisive role in ensuring the safety of aquatic product globally. The present study was undertaken to examine the potential sources of persistent halogenated compounds (PHCs), herein including polybrominated diphenyl ethers (PBDEs) and organochlorine pesticides (OCPs), to typical aquaculture environments of South China and input pathways of PHCs in fish body. Besides, health risk associated with consumption of fish exported from China for global consumers was estimated. The results indicate that PHC were ubiquitous in all environmental compartments, including air, rain, water, fish feed, fish and sediment, under investigation. Dry deposition was the main input route of PBDEs (particularly BDE 209) to the aquaculture environments, while fish feeding contributed the most to OCP (especially DDT) loading. This difference was attributed to the different use histories of PBDEs and DDTs. In general, dietary uptake was the major route for exposure of fish to DDTs; conversely, gill uptake was a more important uptake route for all PBDE congeners and some DDT congeners (p,p'-DDE and -DDD) in freshwater fish. Metabolism was an important elimination mode of DDTs in fish, but congener-dependent elimination for PBDEs was observed. Finally, health risk derived from consumption of fish from China was within the acceptable levels for global consumers. Nevertheless, protection of fish feed from contamination is an effective measure to minimize PHC residues in farmed fish.

AGFD 188 Sorption of polyphenolics (tannins) to natural soils Michael A. Schmidt , schmidm7@muohio.edu Ann E Hagerman ; Javier Gonzalez ; Jonathan J Halvorson . Chemistry and Biochemistry, Miami Univ., Oxford OH Appalachian Farming Systems Res. Ctr., Agricultural Research Service, Beaver WV 25813, US The plant secondary metabolites known as tannins (polyphenolics) comprise up to 40% of the dry mass of plant tissue. Tannins have potent bioactivities ranging from protein precipitation to metal binding and radical quenching, and can affect nutrient metal availability, nitrogen availability, and soil carbon loading. Tannins enter soil via litter decomposition, rain throughfall, and root deposition, but little is known about their fate in soils. I have examined sorption kinetics, maximum sorption, and the soils components responsible for sorption using six model polyphenols. Sorption is a function of features of the tannins such as hydrophobicity, which is positively correlated with the amount sorbed to an Ultisol soil. An extraction method was developed to remove bound tannin from soil. We developed a model for predicting the maximum amount of tannin sorbed to a particular soil based on sorption by individual components of the soil such as clay, sand, and soil organic matter.

AGFD 189 Cellulose solvent-based biomass pretreatment: Concentrated phosphoric acid vs. ionic liquid Noppadon Sathitsuksanoh , sathino@vt.edu; Zhiguang Zhu ; Y-H. Percival Zhang Dept. of Biological Systems Engineering, Virginia Tech, Blacksburg VA Institute for Critical Technology and Applied Sciences (ICTAS), Virginia Tech, Blacksburg VA DOE BioEnergy Science Center (BESC), Blacksburg VA Corn stover was pretreated by two different cellulose solvents – concentrated phosphoric acid and ionic

liquid (IL). Glucan digestibilities of cellulose solvent- and organic solvent-based lignocellulose fractionation (COSLIF)-and IL-pretreated corn stover were 96% and 52%, respectively, at hour 72 at 5 FPU of cellulase per gram of glucan. A drastic difference in glucan digestibility of two methods may be attributed to numerous reasons, such as pretreatment efficiency, IL inhibition, cellulose accessibility to cellulose (CAC), competitive adsorption of lignin, and/or redistribution of residual lignin. Our study showed that although IL can dissolve cellulose completely, regenerated cellulose from IL dissolution was not as active as those made from COSLIF. Moreover, residual IL in the cellulosic material inhibited enzyme hydrolysis rates, resulting in lower glucan conversion. Experiments of the effects of lignin addition on hydrolysis rates suggested a modest negative effect from lignin. After cellulose solvent pretreatment, re-distributed lignin did not show any negative effects on hydrolysis rates. In other words, IL cannot effectively break the recalcitrance of biomass as compared to COSLIF.

AGFD 190 Calcium-dependent characteristics of a subtilisin-like halotolerant proteinase of *Virgibacillus* sp. S K37

Ekkarat Phrommao , Eak.p55@gmail.com, Montarop Yamabhai ; Sureeluk Rodtong ; James L. Steele ; Jirawat Yongsawatdigul . School of Food Technology, Suranaree Univ. of Technology Nakhon-Ratchasima Thailand School of Biotechnology, Suranaree Univ. of Technology Nakhon-Ratchasima Thailand School of Microbiology, Suranaree Univ. of Technology Nakhon-Ratchasima Thailand Dept. of Food Science, Univ. of Wisconsin-Madison *Virgibacillus* sp. SK37 produced a Ca-dependent halotolerant proteinase. The objective was to investigate the activation of an inactive recombinant enzyme by CaCl₂. Partially(Ca-apoenzyme) or completely (holoenzyme) activated enzymes were prepared without and with pre-incubation in 10 mM CaCl₂, at 30°C for 30 min, respectively. Ca-apoenzyme possessed autolysis at >30°C while holoenzyme did not show autolytic degradation. Holoenzyme showed optimum activity at pH 7-10.5 and 0-4M NaCl whereas Ca-apoenzyme exhibited limited activity at pH 9-10 and 1.5 M NaCl. At >3 M NaCl, K_m of holoenzyme and k_{cat} of Ca-apoenzyme were decreased. Ca-apoenzyme and holoenzyme exhibited apparent calcium-dissociation constant (K_{dapp}) of 6.58x10⁻⁴ and 2.25x10⁻⁵ M, respectively, as calculated by Hill equation. These results suggested that more than one calcium ion binds per molecule of enzyme and the first bound calcium is necessary for activity while sequential binding is responsible for stability and halotolerant ability.

AGFD 191 Occurrence and formation of benzene in foodstuffs

Raquel Medeiros Vinci , raquel.vinci@ugent.be Joris Van Loco ; Liesbeth Jacxsens ; Thibault de Schaetzen ; Michael Canfyn ; Ilse Van Overmeire ; Bruno De Meulenaer . Dept. of Food Safety and Food Quality, Faculty of Bioscience Engineering, Ghent Univ., Belgium Dept. of Food, Medicines and Consumer Safety, Scientific Institute of Public Health, Brussels Belgium Benzene is classified as carcinogenic to humans by the IARC. Several sources may contribute for the occurrence of this compound in foods, such as, environmental and process contamination and the oxidative decarboxylation of benzoic acid in the presence of ascorbic acid and metal ions. Benzoate salts and ascorbic acid may be naturally present or added as food additives. At low pH, hydroxyl radicals are supposed to be the key intermediate for this oxidative mechanism. This paper studied the occurrence and formation of benzene in foodstuffs. Therefore, a sensitive analytical method for the determination of benzene in all food matrices was in-house validated (LOD=0.5 µg.kg⁻¹). A survey of 450 food samples from Belgium showed that benzene was omnipresent. A probabilistic dietary exposure for the adult Belgium population was performed. In addition, since several reactions in foods may give rise to the generation of hydroxyl radicals, their potential to decarboxylate benzoate was evaluated. Acknowledgements Financial support by the Belgian Federal Public Service of Health, Food Chain Safety and Environment (contract 08/02 Benzene) is gratefully acknowledged.

AGFD 192 Differences in detailed chemistries among moist snuff, snus, and novel smokeless tobacco products

John H. Lauterbach , john@lauterbachandassociates.com; Deborah A Grimm . Lauterbach & Associates, LLC, US Tulane Univ., Some health experts recommend that smokers, who refuse to quit or refuse to use nicotine replacement therapies, switch to low-TSNA smokeless tobacco products (STP). US-style moist snuff is the most popular STP, but has attracted criticism because of levels of TSNAs and PAHs. Snus and other novel STP reportedly have much lower levels of TSNAs and PAHs, but detailed chemical information on those products needed for a full toxicological assessment has not been available. We used two GC-MS scan techniques [Direct Silylation scan (in situ extraction and silylation with DMF/BSTFA) and Hexafluoroisopropanol scan (in situ extraction with HFP)] to characterize several brands of novel snus and dissolvable tableted snuff products and compared the results with those we obtained on the new CORESTA reference snus, moist snuff, and dry snuff products. Our studies showed presence of reaction products not expected based on the tobacco blends, ingredients, and processing conditions likely used.

AGFD 193 Evaluation of the antifungal activities of twenty three spices against plant pathogens

Mohamed M Radwan , mradwan@olemiss.edu, Nurhyate Tabanca ; David E Wedge ; Stephen J Cutler . NCNPR, School of Pharmacy, Univ. of Mississippi, University MS Natural Products Utilization Research Unit, USDA, University. MS Dept. of Medicinal Chemistry, Univ. of Mississippi, University Recently there has been considerable interest in research concerning the possible use of plant extracts for pest management and disease control alternatives to synthetic agrochemicals that are safer for human health and the environment. In our search for new naturally occurring plant protectants from aromatic and medicinal plants, we evaluated 23 spices using direct-bioautography coupled Colletotrichum bioassays. Turmeric, nutmeg, ginger, clove, oregano and black paper showed promising antifungal activity against Colletotrichum spp. Turmeric, nutmeg extracts were chosen for bioassay-guided fractionation and led to the isolation of three curcuminoids and three neolignans. Isolated compounds were subsequently evaluated using a 96-well microbioassay against plant pathogens. *Phomopsis* species were the most sensitive fungi to these compounds. *Phomopsis obscurans* causes leaf blight of strawberry and other plants. *Phomopsis viticola* causes leaf spot which is an important disease of grapes worldwide. Bioassay-guided fractionation of the other bioactive spices is still under investigation.

AGFD 194 Environametal regulation of human bioactive vitamins (ascorbic acid, folate, and carotenoids) in fruits and vegetables

Gene E Lester , gene.lester@ars.usda.gov, 10300 Baltimore Ave., Bldg. Food Quality Lab, USDA-Agricultural Research Service, Beltsville Maryland A diet rich in fruits and vegetables provides an abundance of human health compounds. Organic compounds synthesized originally by plants are known to have a multitude of human bioactive benefits; and three of the most important bioactive compounds are vitamins A (derived from provitamin A carotenoids e.g. b-carotene), B9 (folate) and C (ascorbic acid) are abundant in and

easily biosynthesized from fruits and vegetables. However, concentrations of these bioactive vitamins in plant foods are highly impacted by environmental/production factors (soil texture, pH and fertility, air temperature, light intensity and quality, greenhouse vs. field, irrigation, pests and pollution) and genetic factors (fruit size). As such, an illustrative review will focus on vitamins B9, C and provitamin A, and how the aforementioned environmental and genetic factors affect their accumulation in plant foods.

AGFD 195 Effect of preharvesting and postharvesting factors on phytochemical content and antioxidant activity of almonds and pistachios

Oliver Chen , oliver.chen@tufts.edu, Jean Mayer USDA Human Nutrition Res. Ctr. on Aging, Tufts Univ., Boston MA The consistency of the phytochemical contents and antioxidant capacity of plant foods across cultivars, growing regions, and harvest years as well as the impact of processing has received little attention. Growing region and harvest year affect the total phenolics (TP) and flavonoid content but not the total antioxidant capacity (TAC) of almonds. Cultivar affects flavonoid content and TAC in almonds. Almond cultivars affect flavonoid synthesis pathways but seasons and regions did not have impact. Using the results of polyphenol, total phenols (TP), and TAC, multivariate analysis distinguished harvest years and most cultivars with 80% confidence. Roasting decreases TP and TAC but not flavonoid content of almonds, while storage for up to 15 months doubles flavonoid content. Pasteurization does not change TP, TAC, or flavonoids in almonds. Bleaching decreased phytosterol content in pistachios. Thus, preharvesting and postharvesting factors have marked impact on phytochemical content in almonds and pistachios.

AGFD 196 Effect of cultivar on the phenolic composition and antioxidant properties of basil (*Ocimum basilicum* L.)

Emily D. Niemeyer , niemeyee@southwestern.edu; Eileen M. Kwee . Dept. of Chemistry and Biochemistry, Southwestern Univ., Georgetown TX Basil (*Ocimum basilicum* L.) is a common culinary herb that is known to contain high levels of polyphenolic compounds. In the current study, we examine how cultivar impacts the phenolic composition and antioxidant properties of 16 different basil varieties. For all basil samples, total phenolic contents were determined using the Folin-Ciocalteu method, total anthocyanin levels were quantified using a colorimetric assay, and antioxidant activities were determined using the DPPH (2,2-diphenyl-1-picrylhydrazyl) and ferric ion reducing antioxidant power (FRAP) assays. High performance liquid chromatography was used to quantify individual concentrations of the four most abundant basil phenolics: rosmarinic, chicoric, caftaric and caffeic acids. This presentation will illustrate that cultivar selection significantly impacts polyphenolic concentrations, individual phenolic profiles, and antioxidant activities in the basil cultivars studied.

AGFD 197 Effect of organic and inorganic fertilizers and pesticides on the content of antioxidants in brown rice

Zhimin Xu , zxu@agcenter.lsu.edu.; Arvin Paul P. Tũaño ; Michelle B. Castillo ; Cezar P. Mamaril ; Rosaly V. Manaois ; Marissa V. Romero ; Bienvenido O. Juliano Food Science Dept., Louisiana State Univ. Agricultural Center, Baton Rouge Louisiana Philippine Rice Research Institute, Los Baños Laguna 4031, Philippines Antioxidants in the brown rice fertilized by organic and inorganic fertilizers and pesticides were investigated. The study was undertaken for two seasons (dry and wet) in 2009. The experimental design was a split-plot design consisting of two main plots and three subplots with four replications. The two main plots consisted of with pesticide and without pesticide. The subplots included organic and inorganic fertilizer. Antioxidants in brown rice, α -tocopherol, α -tocotrienol, γ -tocopherol, γ -tocotrienol, total tocopherols, and γ -oryzanol, were determined. It was found that there was no consistent effect on the content of each antioxidant in the two season brown rice. Total phenolics content of the wet season organic rice was slightly lower than that of the rice treated with inorganic fertilizer and pesticide, while the organic milled rice had lower protein content than milled rice treated with inorganic fertilizer. The effect of cultural practices on brown rice antioxidants was not found in this study.

AGFD 198 Acclimatization of *Smallanthus sonchifolius* for oligofructans production in Mississippi

Rita Moraes , rmoraes@olemiss.edu, Franck Dayan Yan-Hong Wang; Joko Sumyanto; Greg Swain; Antonio Cerdeira ; Ikhlas Khan Center for Water and Wetland Resources, Univ. of Mississippi, Abbeville MS ARS, USDA -ARS, University. MS Nat'l Ctr. for Natural Products Research, Univ. of Mississippi, University. MS Embrapa, Brazilian Dept. of Agriculture, Jaguariuna, Brazil 5 Dept. of Pharmacognosy, Univ. of Mississippi, Abbeville The Andean herbaceous species *Smallanthus sonchifolius* (Poepp. & Endl.) H. Robinson (Asteraceae), also known as yacon, has tuberous roots rich in oligofructans, a dietary blood sugar modulator soluble fiber with low caloric index. These sugars are stored in the underground parts by the direct involvement of two enzymes 1-fructosyltransferase (1-SST – EC 2.4.199) and Fructan 1-fructosyl transferase (1-FFT – EC 2.4.1.100), while fructan -1-exohydrolase (1-FEH – EC 3.2.1.153.) mobilize the fructans. Yacon's leaves are also good source of chlorogenic and 3,5,3',5'-dicaffeoylquinic acids, compounds with antioxidant properties that adds value to the crop in the tea market. This species was selected as a pharmaceutical crop to be adapted to Mississippi studying temperature fluctuation and its effect on the quality of yacon leaves, tuberous roots and rhizophores production. Yacon was successfully adapted to North Mississippi, yielding an average 26 t/ha of tuberous roots and 48 t/ha of rhizophores. Foliage harvested in mid-November had the highest content of chlorogenic and 3,5-dicaffeoylquinic acids while tuberous roots and rhizophores produced the highest yield of fructans. The content of oligofructans in tuberous roots and rhizophores decreased after leaves injured by frosting thus affecting quality of the underground parts.

AGFD 199 Metabolomic evaluation of the effects of growth conditions and harvest time on bioactivity in Chinese medicinal plants

Wen-Te Chang , wtchang@mail.cmu.edu.tw, Ruey-Min Hsieh ; Ching-Liang Chu ; Ming-Kuem Lin ; Meng-Shiou Lee ; Wen-Huang Peng . School of Chinese Pharmaceutical Sciences and Chinese Medicine Resources, China Medical Univ., Taichung Taiwan Republic of China Biology Division, Taiwan Sugar Research Institute, Tainan, Taiwan Republic of China Immunology Res. Ctr., National Health Research Institutes, Miaoli, Taiwan Republic of China The proper growth conditions and harvest time are particularly important because the quantity of the active constituents vary in some cultivated Chinese medicinal materials (CMM) considerably. In order to acquire a comprehensive vision, plant metabolomics and pharmacological experiments were applied into our investigation of the effects of these two extrinsic factors on bioactivity of CMM. We illustrate the effect of growth conditions and harvest time on bioactivity of CMM using *Gentiana scabra* and *Panax ginseng* as the examples. The *G. scabra* have been transferred from Northeastern China, the original geographic source, and cultivated at agricultural field of tropic region in Taiwan. Furthermore, the evaluation of metabolic profiling and hepatoprotective activity of two cultivated *Gentiana* was compared. In addition, the bioactivity of

immune-stimulation of different cultivated ages of ginseng was evaluated using dendritic cells (DCs) assay platform. The result provides us a different viewpoint for the harvest time of *P. ginseng*.

AGFD 200 Effects of myrosinase inactivation on glucosinolates and anthocyanins from red radish (*Raphanus sativus* L.) root Pu Jing , pjcolumnbus@gmail.com, Key Lab of Urban Agriculture (South), Shanghai Jiao Tong Univ. Shanghai China
Temperature and pH inactivations of myrosinase on glucosinolate degradation and anthocyanin retention were investigated. The myrosinase with major molecular fraction of 60 kD determined by SDS-PAGE analysis had the lowest enzymatic activity at high acid or alkaline condition (pH < 4 or > 8), where glucosinolates and anthocyanin were stable at pH > 3 and < 4, respectively. A heat treatment at 90 °C for 30 min inactivated myrosinase, whereas 12.74% of glucosinolates have been thermally degraded and anthocyanins are quite heat resistant. Generally, the maximum anthocyanin pigments and less glucosinolate degradation would be achieved in an environment with pH range (3~4) and/or after heat treatment of 90 °C for 30 min. The results showed that an appropriate pH adjustment or heat treatment may inactivate myrosinase with less impact on anthocyanins and glucosinolates. Therefore, bioactive compounds in radish products might be protected and sensory qualities of radish products could be improved.

AGFD 201 Exploring Sri Lankan medicinal plants: A rich source of bioactive phytochemicals Radhika Ramani Samarasekera , radhika@iti.lk.; Patrick Hemalal Kirihettiliyangage ; Athar - Ata . Dept. of Herbal Technology, Industrial Technology Institute, Colombo Sri Lanka Dept. of Applied Research and Development, Hemas Manufacturing (Pte) Ltd, Dankotuwa Western, Sri Lanka Dept. of Chemistry, Univ. of Winnipeg , Canada Sri Lanka contains enormous biodiversity of medicinal plants and has tremendous potential in having a rich source of chemical diversity to obtain new single entity pharmaceutical ingredients or multi component botanical products. In search for bioactive phytochemicals, our recent studies identified *Acronychia pedunculata*, *Barleria prionitis*, *Caesalpinia bonduc* and *Artocarpus nobilis* exhibiting anti-microbial, free radical scavenging, and acetylcholinesterase (AChE) and glutathione s-transferase (GST) inhibitory activities. Bio-assay guided fractionation of extracts by chromatography afforded active compounds and structures were elucidated by spectroscopic techniques. Acrovestone and demethylacrovestone isolated from extracts of *A. pedunculata* showed free radical scavenging and anti-bacterial activity. Extracts of *B. prionitis* afforded iridoid glycosides and *A. nobilis* afforded cycloartane-type triterpenoids and flavonoids as potential GST and AChE inhibitors. Chemical studies on *C. bonduc* afforded GST inhibiting 13,14-seco-steroids. Sri Lanka practices different cultivation methodologies and these have an influence on the bioactivity and production of secondary metabolites of medicinal plants.

AGFD 202 Ultra-performance liquid chromatographic separation of geometric isomers of carotenoids, polyphenols & antioxidant activities of 20 tomato cultivars and breeding lines Rong Tsao , rong.cao@agr.gc.ca, Hongyan Li ; Ronghua Liu ; Steven Loewen Agriculture & Agri-Food Canada, Guelph Food Research Centre, Guelph, Canada Dept. of Plant Agriculture, Univ. of Guelph, Ontario, Canada Tomato (*Lycopersicon lycopersicum*) is one of the most widely consumed fresh vegetables for its nutritional and bioactive antioxidants (carotenoid, phenolic compounds etc). The total carotenoid contents (all-trans and cis isomers) including lutein, lycopene and β -carotene are range from 24.07-261.86 $\mu\text{g/g}$ DW. Moreover, all-trans lutein, lycopene, β -carotene and their 22 cis isomers could be separated and identified by ultra-performance liquid chromatography (UPLC) method in 15 min. The total phenolic contents including rutin, caffeic acid, gentisic acid, ?-coumaric acid, ferulic acid, chlorogenic acid, quercetin and protocatechuric are range from 4.2 to 6.0 mg/g DW. What's more, the total antioxidant activities as evaluated by photochemiluminescence (PLC) and DPPH free radical scavenging capacity assay were found to correlate well with the total carotenoid contents. It also showed strong positive correlation between the total phenolic contents and the antioxidant values determinate by ferric reducing antioxidant power (FRAP) and oxygen radical absorption capacity (ORAC) assay.

AGFD 203 Carbohydrate composition analysis in processed tomato serum Bicheng Wu , wu161@purdue.edu, Brad L Reuhs Dept. of Food Science, Purdue Univ., West Lafayette IN Cold-break is the initial processing of tomatoes at a temperature around 66-77°C. Due to less thermal abuse, products manufactured from cold-break tomatoes have a better retention of color and flavor, but a lower viscosity. The relatively low viscosity is believed to result from the break-down of pectin by the pectolytic enzymes, which remain active at the lower break temperature. In this study cold-break tomato serum was collected and analyzed by GC, HPLC and H1-NMR. The results showed that free glucose and fructose are the major carbohydrate components of cold-break tomato serum, and only trace amounts of galacturonic acid were detected. Thus, the retention of pectolytic enzyme activity in the cold-break process and the role of pectin in determining the viscosity of the products should continue to be studied.

AGFD 204 Comparison of acrylate monomers for preparing thermoplastic feathers with water resistance through graft polymerization Enqi Jin , jdkxxh_2001@163.com; Narendra Reddy ; Zhifeng Zhu ; Yiqi Yang Dept. of Textiles and Garments, Jiangnan Univ., Wuxi Jiangsu China Dept. of Textiles, Clothing and Design, Univ. of Nebraska-Lincoln, Wuxi Jiangsu China Dept. of Biological Systems Engineering, Univ. of Nebraska-Lincoln, Wuxi Jiangsu China Inexpensive and biodegradable thermoplastics were developed by grafting native chicken feather with different types to increase the thermoplasticity and water resistance of feather films. The effects of type of acrylate on grafting parameters, conversion of monomer to polymer and grafting percentage, were evaluated. It was found that, when monomer concentration was equal, increasing the carbon chain length of alkyl ester group of acrylate decreased the grafting percentage. The influences of acrylate type and grafting percentage on tensile properties and water resistance of grafted feather films were also determined. Feather-g-poly(butyl methacrylate) and feather-g-poly(methyl methacrylate), having molar grafting percentages of 2.44mmol/g approximately, showed good tensile properties and water resistance.

AGFD 205 Biorefinery blueprint: A growth-arrested biotechnological process for manufacturing a portfolio of commodity and fine chemicals Alain A Vertes , mmg-lab@rite.or.jp, Masayuki Inui ; Hideaki Yukawa Molecular Microbiology and Biotechnology Group, Research Institute of Innovative Technology for the Earth, Kizugawa Kyoto, Japan Manufacturing industrial commodity and chemical products from organic raw materials such as agricultural biomass is an old concept (chemurgy) that predates the petrochemical industry. The full utilization of products and by-products from petrochemical plants has been an important factor of

industrial development. However, the extremely efficient cost structures that have been derived in the petrochemical industry over a century are now both a blessing and a curse. The blessing is that these economies of scale and scope have made possible the manufacturing of cheap fuels and materials; in turn these have enabled modern life and thus appear now to be indispensable. The curse is that efforts to displace and replace the petroleum industry by the chemurgy industry for alleviating global warming and fossil fuel supply threats meet a very high economic barrier. This has resulted over the years in a detrimental delay in renewable chemistry technology investment, development, and deployment. The biorefinery concept aims at recreating for agricultural feedstock similar cost structures. Notably, the higher oxygen content of biomass-based compounds makes possible totally novel materials and chemicals with novel properties. An enabling factor is of course the availability of versatile, cost-effective, and robust industrial processes to manufacture an array of chemicals to serve various sectors including the fuel, chemical, industrial polymer, feed, food, cosmetic, and pharmaceutical industries. We report here on a growth-arrested biotechnological process to manufacture ethanol, organic acids, and amino acids from mixed sugars, based on an organism typically used to produce feed and food supplements. The process presents the entire set of fundamental attributes necessary for reaching cost-effectiveness and enabling a rich product portfolio.

AGFD 206 Utilization of waste tea leaves to suppress the odors in compost processes Meng-Lu Wu , g9914731@yuntech.edu.tw , Taiwan Republic of China ; Chitsan Lin Yu-Kang Yuan ; Chuen-Yu Lin ; Ming-Wei Huang . Institute of Safety Health and Environment Engineering, Nat'l Yunlin Univ. of Science and Technology, Douliou Yunlin Taiwan Republic of China Dept. of Marine Environmental Engineering, National Kaohsiung Marine Univ., Nanzih Kaohsiung Taiwan Republic of China Odor emission is one of the most challenging problems in the compost processes. We have found that addition of waste tea leaves into the food waste composting is an effective way to minimize the ammonia (NH₃) odor emission. Two compost piles were compared, the experimental pile with the addition of waste tea leaves, and the control pile without. pH and NH₃ concentration were monitored. The results showed that the experimental pile pH was about 0.2 to 1.7 lower to the control pile during the course of composting. For compost gas monitoring, highest NH₃ concentration during the 21 days composting was only 2 ppm for the experimental pile and 7 ppm for that of the control pile. The addition of waste tea leaves is thought to have the advantage of decreasing pH during the course of composting, thus to suppress the NH₃ emission.

AGFD 207 Sensitive determination of hydroxymethyl furfural in honey and biomass Lipika Basumallick , lipika.basumallick@dionex.com; Deanna C Hurum ; Jeffrey S Rohrer . Dionex Corporation, Sunnyvale CA, Hydroxymethylfurfural (HMF) is a heterocyclic organic compound containing both aldehyde and alcohol functional groups. HMF, produced during heat-treatments of foods from the dehydration of sugars like glucose and fructose, is used as an indicator for spoilage and excessive heat-treatment. HMF is also derived from cellulose and can be used to synthesize several compounds (solvents, fuels etc.) that are currently derived from crude oil. This presentation describes a High Performance Anion Exchange with Pulsed Amperometric Detection method for HMF determination in samples ranging from honey to acid-hydrolyzed corn stover, using electrolytically generated hydroxide eluent, separation on a strong anion-exchange column, and electrochemical detection with disposable gold working electrodes. The proposed method has a broad linear range (0.1-1000 µg/mL), low detection limits (0.04 µg/mL), high precisions, and good recoveries (102 to 112%) in diverse matrices. It requires no eluent preparation and due to good sensitivity and consistent response can be used for routine HMF analysis.

AGFD 208 Structure-function properties of anticorrosive exopolysaccharides Victoria L Finkenstadt , victoria.finkenstadt@ars.usda.gov, Claudiu B Bucur ; Gregory L Cote ; Kervin O Evans . Nat'l Ctr. for Agricultural Utilization Research, USDA, Peoria Nanoscale biobased exopolymer films were shown that provide protection to metal substrates under corrosive environments and that the films could be self-repairing in aqueous environments. This work describes the fundamental properties of thin exopolymer films including thermodynamic properties, film-formation kinetics, and diffusion characteristics. The co-products of a food-grade lactic acid bacterium, *Leuconostoc mesenteroides*, have become increasingly important as a source of enzymes, carbohydrates, and polymers. Specifically, the bacterial exopolysaccharide (EPS), NRRL B-1355, was selected because it was shown to be one of a family of anti-corrosive EPS on metal substrates. The goal was to describe the fundamental properties of polymer coatings on metal substrates. Thermodynamic and kinetic properties were determined for film formation and deposition and took into account the macroscopic variables such as temperature and polymer concentration. Atomic force microscopy (AFM) measurements provide accurate evidence of amount and topography of deposition while attenuated total internal reflectance Fourier transform infrared spectroscopy (ATR-FTIR) complementarily allowed for direct measurement of energy of formation with noticeable temperature dependence. EPS materials also can be used in other nontraditional applications such as biosensors, environmentally sensitive membranes, artificial muscles, actuators, electronic shielding, visual displays, and components in high-energy batteries.



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