



University of Massachusetts
Department of Food Science Newsletter
Volume 26, Number 1, 2014

First of all, make sure to mark your calendar for our **10th Alumni Weekend** on **October 10 and 11**. Further details will be coming in the next Newsletter.

UMass Food Science to Receive Major Pilot Plant Upgrade from Mass Life Science Center



I mentioned in an earlier newsletter that the **Massachusetts Life Science Center** has presented UMass Amherst with over \$100 million in capital grant funding. This funding will be used to establish 3 research centers: Models to Medicine, Personalized Health Monitoring, Models to Medicine and Bioactive Delivery of which Food Science is involved in the latter two. A very exciting aspect for the Department is this funding includes over \$2 million for renovation of the pilot plant and purchasing of new equipment. The equipment will support research in isolation of bioactive compounds, production of nutritional delivery systems,

characterization of delivery systems and systems to determine the efficacy of bioactive compounds and delivery systems. Isolation equipment will include a **supercritical CO₂ extraction system** and a **preparative HPLC with mass spectroscopy**. Delivery system production will include a **nano-crystalizer, hydrogel microsphere encapsulator, benchtop spray drier and spray chiller, NEA pilot scale spray drier with agglomeration, freeze drier, Microthermics UHT pasteurization with a filler, reverse osmosis unit and a continuous centrifuge**. Lab instruments for characterization include **scanning electron microscope, powder laser diffraction, gas sorption surface area analysis**, and a **polymer characterization unit**. We will also be obtaining a **colonic fermenter** to determine how delivery systems impact the gut microbiome.

This funding will truly redefine our 1965 vintage pilot plant and strengthen our capabilities for research with bioactive compounds and development of delivery systems for food. Renovations will begin in May and we should be fully operational by September.

Julie Goddard Receives American Chemist Society Agriculture and Food Chemistry Division Young Investigator Award

Assistant Professor Julie Goddard, Ph.D., was awarded the Young Scientist Award by the Agricultural and Food Chemistry division of the American Chemical Society (ACS) at the ACS National Meeting in



Indianapolis, IN, September 8-12, 2013. The Young Scientist Award is given to an early career investigator for outstanding research in agricultural and food chemistry. Six finalists were selected from a pool of international applicants. Julie was selected as the winner on the basis of letters of recommendation, research productivity, and an oral presentation on her current work. The award is presented by the Division of Agricultural and Food Chemistry of the American Chemical Society, the world's largest scientific society. Dr. Goddard presented her research on developing biomimetic metal chelating polymers. Her group has designed a method to modify the food contact surface of common polymeric packaging materials to possess metal chelating functionality in which

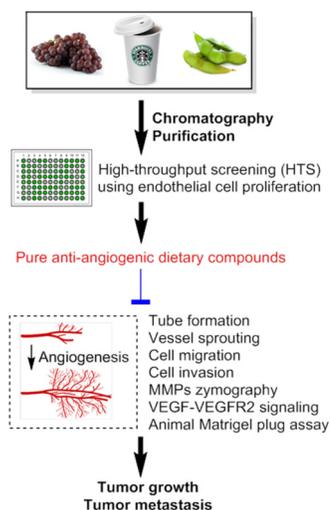
the chelator does not migrate from the material to the food. These non-migratory metal chelating packaging materials exhibited the ability to chelate iron and inhibit lipid oxidation at pH values from 3.0-7.0. The work has resulted in several publications and an international patent application.

Research News

We are extremely excited about two new Assistant Professors that joined the Department this fall. Below are summaries of their research.

Guodong Zhang: Bioactive Food Components

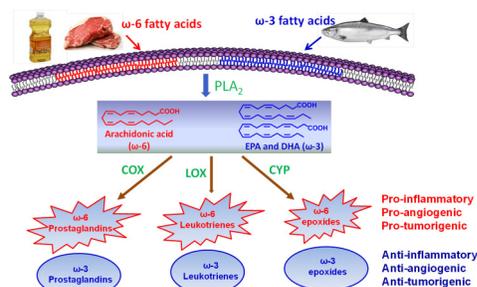
Dr. Zhang's research interests focus on food chemistry and nutrition biochemistry. These research interests include:



(1) Analysis, isolation and structural elucidation of bioactive compounds from food matrix. These research activities include HPLC, GC, LC and MS analysis of bioactive compounds in food matrix, isolation and purification of compounds from food matrix by column chromatography, structural identification by a combination of mass spectrometry and NMR, and organic synthesis for scale-up preparation of the bioactive compounds for further evaluations.

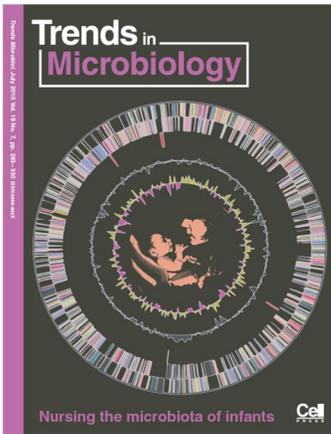
(2) Biological activities and action mechanisms of dietary compounds using cell culture and animal models. Investigation of the effects and mechanisms of dietary compounds is critical to develop functional foods or dietary supplements. Dr. Zhang has years of experience in studying the activities of dietary compounds on cancer, inflammation, angiogenesis, tumor growth and metastasis using cell culture and animal experiments.

(3) Omega-3 fatty acids. Dr. Zhang is using a combination of LC-MS/MS-based metabolomics, organic synthesis, cell culture and animal models of human diseases to investigate the specific metabolic pathways and metabolites involved in the health-benefits of omega-3 fatty acids. Substantial epidemiological and pre-clinical data support that omega-3 fatty acids reduce risks of angiogenic diseases such as cancer and macular degeneration. However, the underlying mechanisms are largely unknown and their efficacy in humans remains controversial, making it difficult to implement omega-3 in clinic. Understanding the specific metabolites and enzymes involved is thus critical to develop



better dietary/therapeutic paradigms and human trials to clarify the effects of omega-3.

David Sela: Human Microbiome



Dr. Sela's program is focused on the means by which dietary molecules influence the population structure, and often function, of microbial communities that colonize the human gut. To this end, he has been investigating naturally occurring bioactives in milk that promote a beneficial microbiome in infants and potentially adults for several years. His lab examines host-microbial interactions mediated by nutrition at several levels of resolution.

He studies the genomics and physiology of isolated members of the microbiome that promote optimal health, fermentative microbes, as well as undesirable spoilage and pathogenic microorganisms. He uses high-throughput instrumentation to analyze holistic biological systems utilizing so-called “-OMICS” based approaches.

This includes DNA sequencing, transcriptomics, proteomics as well as other methodologies similar in scope. This is in addition to molecular genetics and biochemistry applied to deconstruct individual metabolic pathways and constituent genes that interact with ingested food and/or the human host.

Moreover, he is interested in the form and function of microbial communities that are studied as an aggregate microbiome. This includes characterizing both the human microbiome, as well as microbial assemblages that persist in food production facilities. He primarily employs non-culture based sequencing to detail population dynamics and shifts over time.

Finally, he investigates the interconnectedness of microbial metabolic operations with that of their human host, particularly where it intersects with diet and health. To this end, he seeks to understand the influences of diet on one's microbiome in order to better predict health outcomes and develop dietary interventions where appropriate. Again, he uses DNA sequencing technology to track the succession of various microbial communities, as well as interrogate markers of human health such as those related to inflammation.

Furthermore, he is interested in the mechanisms by which indigenous microbes transform nutritive or bioactive molecules, either availing them to, or sequestering them from, their human host. These general questions are primarily answered through human subject studies, though there is much to be learned from in vitro and animal models as well.

Industrial relevance



His work has several clear and immediate applications. He seeks to understand the nutritive properties of foods and their derivatives, as they are “filtered” through one's resident microbiome. Broadly, he seeks to better characterize what constitutes a healthy microbiome and how he could best promote this state through the introduction of wholesome foods. A core mission of his group is to innovate next-generation prebiotic molecules to foster a protective microbiome, as well as more efficient probiotic selection, preparation, and delivery. Finally, he is interested in examining the various microbial populations that colonize processing facilities. Particularly in how these communities may influence process performance by either contributing to the maintenance of ideal sanitary conditions or by

providing a reservoir of undesirable microbial agents.

Scholarship Luncheon

This fall we held our 4th Annual Scholarship Luncheon to honor the excellent work of our undergrad and grad students. Thanks to the generosity of our great Alumni, we were able to give financial support to 26 students.



Alumni Graduate Fellowship

Jennifer Komaiko receiving her Fellowship from **Herb Stone**.



H.O. Hultin Scholarship

First place winner **Shintaro Pang** receiving his scholarship from **Yongjing Li**.

Runner ups: **Mingyue Song, Ketinun Kittipongpittaya, Yingyi (Erica) Mao**



F.J. Francis Graduate Scholarship

First place winner **Cynthia Lopez-Pena** receiving her scholarship from **David Rey**.

Runner ups: **Yingyi Mao, Charmaine Koo**



Perrozzi Scholarship

Liz Sharpe receiving the Department's top scholarship from **Charlie Feldberg**.

Buttrick Scholarship Winners

Julianne N. Bell
Paula Feldmar
Kathryn F. Harris
Victoria Sbrogna
Lianna R. Tilton
Emily W. Travers

Alumni Scholarship

Erin Aversa
Nicholas J. Berus
Nina B. Callahan
Kelsey E. Decker
Joshua Gukowsky
Kelsi C. Harper
Kathleen Q. Ho
Rachael A. Picard
Sydney E. Tobin
Christopher K. Von Achen

Aaron C. Yip

Our students also continue to receive many prestigious National and Campus Awards:

Bicheng Wu received the Eugene M. Isenberg Scholar Award for \$10,000. Both **Bicheng** and **Cynthia Lopez-Pena** are finalists in the 2014 ACS-AGFD Graduate Research Award Symposium this spring in Dallas.

Ketinun Kittipongpittaya and **Ying Yang** were both named American Oil Chemists Honor Students and will receive a travel award to attend their annual meeting. The following students received IFT Feeding Tomorrow Scholarships: **Leann Barden, Jiajia Rao, Jennifer Komaiko, Bicheng Wu** and **Ying Yang**.

UMass Food Science Lipids and Health Round Table

This fall the Department organized a round table on **“Fats and Oils: Where Food Function Meets Health”**. The round table participants were leading food and nutrition scientists who highlight research and product innovations that explore the nutritional impact of fatty acids in the food supply. The latest on metabolic response and health benefits associated with foods made with new nutritional and functional oils were discussed, along with a detailed look at how science-based advances in preparation methods and processing technologies affect the nutrient profile of fats and oils. How oil innovations align with dietary guidance and food policy was also summarized. Eric Decker, Julian McClements and Brent Flickinger from ADM provided the perspective of the role of fats in foods and new innovations to make healthier fats and food products. Penny Kris-Etherton, Kevin Fritsche, Danielle Reed and Nick Bellissimo covered the health impact of nutritional lipids. Maureen Storey, Theresa Nicklas and Adam Drewnowski covered current eating trends and Barbara Schneeman provided an FDA perspective. A journal issue on the roundtable will be published in *Food and Function*.

Faculty Activities



Eric Decker visited and gave lectures at Euro Lipid Fed in Antalya, Turkey, Toyo University in Japan and Kasetsart University in Thailand. During the Thailand trip, he met with UMass alumni to celebrate the past 20 years of student exchange when 23 Thailand students received their PhD's from UMass.

Julie Goddard gave an invited talk on “Reducing Additive use via Non-Migratory Active Packaging” at the 245th ACS National Meeting, Division of Agricultural and Food Chemistry and “Non-fouling Materials for Dairy Processing” at the Food Additives and Packaging Symposium and the Dairy Ingredient Symposium in San Francisco. Led by her graduate student, Maxine Roman, her group also led “Funtastic Food Science” as part of the campus-wide K-12 STEM outreach event, ScienceQuest.

Lili He gave several talks at the Eastern Analytical Forum in New Jersey. Along with **Hang Xiao**, she also gave a talk at Dupont in Shanghai, China under the invitation of **Yongjing Li**, our newest Advisory Board Member. Lili also gave talks at several Chinese Universities.

Amanda Kinchla organized 3 industry short courses on Food Emulsions (60 participants), HACCP training (26 participants) and Better Process Control School (13 participants).

Ron Labbe presented a talk on Clostridium species at a Symposium on Foodborne Pathogens at International Conference on Food Safety in Monterrey Mexico (October 2013).

Julian McClements gave an invited lecture “Structural Design of Colloidal Delivery Systems for Health and Wellness” at the Leading Edge seminar of the Chemical Engineering and Applied Chemistry Department at the University of Toronto. He is also giving a talk on Fundamentals of Vitamin Stabilization at NASA.

Lynne McLandsborough gave a talk on “Survival, transfer, and inactivation of Salmonella on plastic materials used in tomato harvest” at the Center for Produce Safety Annual Meeting in Rochester, NY.

Sam Nugen is part of a team consisting of the University of Cincinnati, GE and UMass which received a grant from the Air Force Research Labs to develop a wearable biosensor to continuously monitor biomarkers from sweat. The project will use paper fluidics developed by the Nugen Research Group to allow monitoring over a 24 hour period.

Yeonhwa Park presented a lecture at the Annual Meeting and Expo for the Korean Society of Food Science and Technology in August and gave two lectures at Universities in Korea. Yeonhwa will be on sabbatical next semester when she will spend some time visiting research groups in Korea and Japan.

Micha Peleg gave a two week graduate course on nonlinear kinetics and risk assessment in foods at the Department of Chemical Engineering of the Universidad de la Republica, Montevideo Uruguay (November 2013). He also gave a seminar on Stochastic Models of Microbial Growth and Inactivation and Spores Germination at the Faculty of Biotechnology and Food Engineering at the Technion, Israel Institute of Technology.

David Sela presented an invited talk at the International Milk Genomics Consortium Annual Meeting entitled "Anything you can do I can do better: divergent mechanisms to metabolize milk oligosaccharides by two bifidobacterial species" and has his first students joining his lab group this spring.

Hang Xiao was invited to present his research work health-promoting effects of bioactive food components at several prestigious meetings including the Drug Discovery and Therapy World Congress (Boston, MA) and the Council for Responsible Nutrition (CRN) Day of Science workshop (Park City, UT). Dr. Xiao has also been invited as one of featured speakers in the “Food & Function International Symposium” organized by the Royal Society of Chemistry. The symposium was held in three cities in Taichung (Taiwan), Beijing, and Chongqing, China.

Fergus Clydesdale Professorship Campaign Update

Our last newsletter announced the start of a new fundraising campaign to fully fund the **Fergus Clydesdale Professorship** to \$1.5 million so that the Professorship qualifies for the Provost’s offer to annually match the earnings of the endowment. I am extremely pleased to announce that we have already reached our fund raising goal. With the amazing early success of the campaign, both the Department and the Advisory Board agreed to increase our fund raising goal to \$1.8 million so the Professorship endowment can both hire a new faculty and support graduate student research.

This means we have to raise another \$250,000 to raise in the next 2 years to take advantage of this amazing offer to get a 1:1 match on all income generated by the Professorship. If anyone can help us close the final gap, please contact **Rick Robar** at 413-577-1692 or rrobar@cns.umass.edu.