



University of Massachusetts
Department of Food Science Newsletter
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UMass Food Science to Host Evening Alumni Reception at Buddy V's at the IFT Meeting in Las Vegas



After many years of hosting a breakfast Alumni reception at IFT, this year we will switch to an evening reception at Buddy V's in Las Vegas. Escalating prices and early start times due to changes in IFT scheduling caused a decrease in attendance at the past several IFT Alumni Receptions. This year, IFT offered to help Departments move out of the headquarter hotel while still collecting Departmental reception fees through the IFT registration website. On a very tight timeline, **Rachel Zemser**,

Toni Manning and **Jennifer Mancuso** quickly secured Buddy V's for a reception on Monday, June 26th at 5:00 pm. The cost of the reception is \$35 and includes a drink and light appetizers. **Otis Curtis** of the Kerry Group and **David Coles** of D&S Ingredient Solutions have generously offered to sponsor the event. Our hope is that attendance will improve with an evening reception and that the reception can be a kick off for alumni to make dinner arrangements for after the reception. Please mark your calendars and remember to sign up for the reception when registering for the IFT Annual Meeting.

UMass Wins IFT Disney Product Development Competition



A team of UMass Food Science students, **Marie Lawton**, **Ashtri Sastrosubroto**, **Anna Kundmann**, and **Kevin Lee** received the Grand Prize of the IFT Disney Product Development competition for their product: **Elsa's Oat Flurries**. This marks the third year in a row that at least one UMass team has made the finals of an IFT product development

competition. This recent success can be directly attributed to **Amanda Kinchla's** hard work in preparing our teams for product development competitions.

McClements Named Distinguished Professor



D. Julian McClements was named a Distinguished Faculty member being only the second Food Scientist to receive this recognition along with **Fergus Clydesdale** (pictured). Dr. McClements is internationally recognized for his research in emulsion science, colloids and food-based structured delivery systems for bioactive components. A member of the food science faculty since 1994, he was promoted to Associate Professor in 2000 and professor in 2005.

“His 22 years at UMass plus his years before joining our faculty have witnessed stunningly prodigious output. He (along with his research group) has authored four books, edited seven books, published more than 700 scientific articles in refereed venues, published some 45 book chapters and 150 abstracts in conference proceedings. He holds a dozen patents. Despite this amazing record, his output is, if anything, continuing to increase. As his department head notes, he is averaging publication of more than 40 papers per year and in 2015 published 88,” Subbaswamy and Newman said in their endorsement. “He is the most cited author in the entire field of agriculture.”

Lili He named to the Talented Twelve by the American Chemical Society

Lili He was named to the Talented Twelve by the American Chemical Society as one of the top 12 young chemist in the country (see article below from Chemical and Engineering News). This competition included all fields of chemistry and chemical engineering. Of note, Lili is the only Food Scientist to have ever received this award.

Lili He Codename: Contaminant Catcher

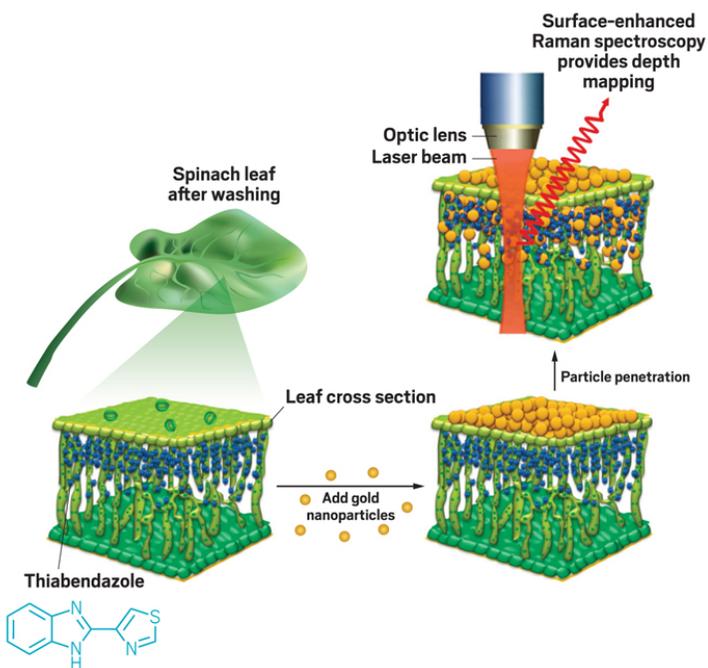


We’ve all been there: eating something that we think is delicious in the moment, only to be taken down by a full-on intestinal apocalypse an hour or two later. It wasn’t obvious that a pathogen lurked in the food we chowed, just like it’s not obvious when other contaminants such as pesticides and nanoparticles end up on dinner plates.

Regulators, researchers, and the general public are increasingly concerned about these kinds of food pollutants. But it’s not like you can avoid the risk by simply not eating, quips **Lili He**, a food chemist at the University of Massachusetts, Amherst.

Drawn to using chemistry to study something as fundamental to everyday life as food, He set out during her Ph.D. to find promising analytical technologies to monitor and analyze food

contaminants. She struck gold with surface-enhanced Raman spectroscopy (SERS), a technique that uses laser light to detect signals from individual molecules inside a complex sample by observing their vibrational and rotational motions. The method uses metallic nanoparticles to boost weak signals—up to 10,000 times—allowing He to identify minuscule amounts of problematic chemicals among food’s messy mixture of molecules.



Since starting her own labs, He has pioneered a SERS technique for studying the depth at which pesticides can penetrate spinach leaves. Regulators worry that washing the leaves might not be enough to get rid of pesticides, potentially exposing consumers to harmful levels of the chemicals. He is also developing SERS methods to measure and monitor dangerous bacteria and unwanted nanomaterials in food. Both the U.S. Department of Agriculture and the Food & Drug Administration have put calls out for techniques that can identify nanoparticles that enter food from pesticides, packaging, and food additives, and He wants to prove that SERS is the right choice. In the

long term, He imagines helping to build a miniaturized SERS cell phone add-on that would allow people to look for unwanted pesticides, microbes, or nanomaterials in food. This could put the power to do food safety checks in the hands of concerned consumers. Lili He has shown that surface-enhanced Raman spectroscopy (SERS) can be used to monitor food contamination. As shown here, she observes that SERS, which can amplify molecular signals with nanoparticles, tracks the depth of penetration of pesticides such as thiabendazole in spinach, a concern because many people assume pesticides are removed by washing. Adapted from Chemical Engineering News, American Chemical Society; <http://talented12.cenmag.org/lili-he/>

New Pilot Plant Open to Business



In 2014, the UMass Institute for Applied Life Sciences (IALS) was established, based on a total investment of more than \$150 million from the Massachusetts Life Science Center (MLSC) and UMass Amherst. IALS aims to translate fundamental discoveries into novel candidate medical devices, biomolecules, and delivery vehicles that benefit human health. IALS works in close collaboration with industry partners to combine the best academic innovation with a goal-directed focus on delivering commercially significant products, services, and technologies. IALS manages 30 core equipment facilities to enable its

translational mission. These facilities are available to both academic researchers and industry partners on a fee for service basis. A full listing of these facilities can be found here: <http://www.umass.edu/ials/core-facilities>

One of the IALS core facilities is for Nutraceutical Formulation which is housed in the Food Science Pilot Plant. The focus of this core facility is to provide equipment for isolation of bioactive food components, production of delivery systems such as emulsions and powders and evaluation of their efficacy in human health. The core has equipment for several food processing operations including extraction by supercritical carbon dioxide and preparative HPLC, concentration by reverse osmosis, thermal processing by retorting and ultrahigh/ HTST pasteurization and encapsulation by nano-crystallization, freeze/spray drying (pictured). Instruments are also available to characterize liquid and dried delivery systems and test their biological efficacy. Space is also available for standard food production operations.

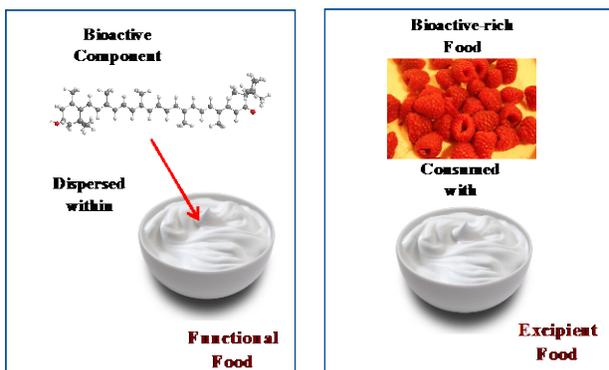
Fee for facilities use can be found at https://www.umass.edu/ials/nutraceutical_formulation

Clydesdale Professorship Campaign concludes at over \$2.1 M

After five years of hard work and generous contributions from both alumni and friends of the Department, we are pleased to announce that the Fergus Clydesdale Professorship Campaign has closed at a fund raising total of over \$2.1 million. The original goal of the campaign was \$1.5 M which would have allowed us to hire a new faculty member. However, with the immense success of the campaign, we will not only be us hiring a new faculty member but will be naming a Clydesdale Scholar from our current faculty. The Clydesdale Scholar will receive research funding for a period of 5 years. The endowment funds will be available July 1, 2017 after which the Clydesdale Scholar will be named and the search for the new faculty member will begin.

Designing Excipient Foods to Improve Oral Bioavailability of Nutraceuticals

Julian McClements and **Hang Xiao**: Natural and processed foods contain a wide variety of bioactive components that have potential health benefits, including vitamins, minerals, and nutraceuticals. Regular consumption of foods containing these bioactive components may therefore help prevent the onset of chronic diseases (such as heart disease, diabetes, hypertension, or cancer) or to improve human wellbeing and performance



(such as attention, alertness, stamina, and energy levels). Nevertheless, the potential health benefits of many bioactive components present within foods are not fully realized because they have low oral bioavailability, *i.e.*, only a small fraction of them is actually absorbed by the human body in a bioactive form. Consequently, there has been great interest in specifically designing foods to improve the bioavailability of these bioactive components. In general, there are two main approaches that can be used based on food matrix design (**Figure 1**):

Functional foods: A functional food contains one or more bioactive components incorporated within the food matrix. Some examples of commercially available functional foods are milks fortified with vitamin D, orange juice fortified with calcium, spreads fortified with phytosterols, and yogurts fortified with ω -3 fatty acids.

Excipient foods: An excipient food consists of a food matrix that is specifically designed to improve the oral bioavailability of bioactive components present in other foods co-ingested with it. Thus an excipient food may not have any inherent health benefits itself, but it can boost the potential health benefits of other foods, such as fruits and vegetables. Some potential examples of excipient foods that could be designed to increase the bioavailability of bioactive components in other foods are dressings with salads, sauces with cooked vegetables, and creams with fruits.

The composition and structure of excipient foods are specifically designed to improve the bioaccessibility, absorption, and transformation characteristics of the bioactive agents. For example, lipids can be used to increase the bioaccessibility of hydrophobic bioactives, spices can be used to block efflux mechanisms and therefore increase absorption, and antioxidants can be added to inhibit oxidation in the gastrointestinal tract.

The principle of designing the composition and structure of food matrices to improve the bioavailability of bioactive agents may lead to the development of a whole new class of foods that can boost the health benefits of natural and processed foods. Research is currently on-going to create strategies of creating excipient foods that are commercially viable.

Citations:

McClements, D. J., Li, F., & Xiao, H. (2015). The nutraceutical bioavailability classification scheme: Classifying nutraceuticals according to factors limiting their oral bioavailability. *Annual Review of Food Science and Technology*, 6. doi: 10.1146/annurev-food-032814-014043.

McClements, D. J., & Xiao, H. (2014). Excipient foods: designing food matrices that improve the oral bioavailability of pharmaceuticals and nutraceuticals. *Food & Function*, 5(7), 1320-1333. doi: 10.1039/c4fo00100a

Faculty News

Amanda Kinchla hosted UMass's first Food Safety Modernization Act (FSMA) Preventive Controls workshop. Amanda also helped coordinate and spoke at the Northeast Center for Advance Food Safety annual meeting to discuss strategies to develop an educational center for the northeast to provide support for small and medium growers affected by FSMA.

Maria Corridini received a Northarvest Bean Growers Association's grant on "Process induced modifications of whole bean flour to tailor bioaccessibility of carbohydrates and proteins." And a grant from the Macao Foundation to assess "Integrity and Innovation in Food Systems". She was also appointed to the Editorial Board of Food Biophysics

Eric Decker was named the Chair of Food and Nutrition Science Solutions Task Force, a joint program of IFT, American Nutrition Society and the Academy of Nutrition and Dietetics. He has also been working with the scientific advisory board of the Cranberry Institute.

Lili He gave invited talks at 3M and the Eastern Analytical Society's Young Scientist Award Session. She also received a grant from Diversified Laboratories to develop new analytical methods for pesticide detection in vegetable oils.

Ron Labbe gave a lecture on "Bacterial spore-forming pathogens in foods" at International Association for Food Protection's 5th Latin American Symposium in Cancun, Mexico.

Julian McClements in conjunction with Hang Xiao gave a lecture at Harvard School of Public Health: "Food-grade nanoparticles: Properties, applications, gastrointestinal fate, and potential toxicity". The presentation will soon be available as a podcast.

Yeonhwa Park was on the College of Natural Science's Dean Search committee and she presented her research for the UMass Biotap Program. Her student, Quancai Sun received Society of Toxicology Graduate Student Travel Award to attend their Annual Meeting.

David Sela organized a symposium at Experimental Biology entitled, "Advances in nutritional glycobiology: the oligosaccharides of human milk." and participated in a continuing education program for the 21st Annual Gastrointestinal Teaching Day at Health Quest (Poughkeepsie, NY). His lab group gave several papers at the Pioneer Valley Microbial Symposium.

Hang Xiao began serving as the Chair of Food Chemistry Division of IFT and was appointed as an Associate Editor for the Royal Society of Chemistry journal "Food & Function". Hang also gave an invited talk on using lipid nanoparticles to enhance health benefits of food components during the 9th International Symposium of Food Science in Shenyang, China.

Guodong Zhang gave an invited talk on "Cytochrome P450-derived fatty acid epoxides in pathology of colon cancer and obesity" at the International Symposium on Polyunsaturated Fatty Acids and Metabolism in Tianjin, China. Guodong also received a Faculty Research Grant/Healey Endowment Grant on the health impact of oxidized ω -3 fatty acids and received an industry from to study miracle fruit oil.