



University of Massachusetts
Department of Food Science Newsletter
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UMass Food Science Hosts 8th Alumni Weekend

We had an absolutely tremendous Alumni Weekend on September 16th and 17th. We had over 90 attendees representing UMass Food Science classes from 1954 to 2010. Many thanks to the organizing committee which included **Margaret Domejczyk** (Chair), **Liisa Holcomb**, **Rachel Zemser**, **David Coles**, **Taygun Basaran**, **Amanda Kinchla**, **Jackie Mathews**, **Darinka Djordjevic**, **Katherine Schmidt**, **Meagan Katz** and **Caitlin Bull**. Also many thanks to Food Science staff **Fran Kostek**, **Jean Alamed** and **Dan Kibe** who all helped make the weekend so successful. The committee and staff did a fantastic job putting together overflowing grab bags and gifts for the traditional raffle. In addition, they designed new UMass Food Science shirts and sweatshirts that are available for purchase (please see inserted order form).



This year at the Alumni Weekend dinner we honored our **Student Scholarship** winners. These scholarships would not be possible without the generosity of our great Alumni. We were able to give 17 undergraduate scholarships.

Thanks to the generous support of our Alumni, we now have two graduate endowments to support scholarships. The **Herbert Hultin Graduate Scholarship** was presented to the winner of an oral research paper competition while the **F. Jack Francis Graduate Scholarship** was given to 3 students that won a research paper competition. All of the scholarship winners participated in the Department's Strategic Research Alliance meeting last spring.



Herbert Hultin Graduate Scholarship winner **Jeff Barish** (left) and F. J. Francis Graduate Scholarship winners **Bingcan Chen** and **Wasamon Nutakul** along with Alumni **Darinka Djordjevic** who presented the awards. F. J. Francis Graduate Scholarship winner **Nopawatt Charoensinphon** is not shown.

The Department also has two undergraduate scholarship endowments. **Jay Gilbert** received our top award, the **Perozzi Scholarship**. **Kyle Gariepy** and **Alexis Minniti** both won **Buttrick Scholarships**.



Kyle Gariepy (left), **Alexis Minniti**, **Jay Gilbert** and Alumni **Liisa Holcomb** who presented the Award.

Thanks to the generosity of our Alumni we have also been able to give **Alumni Scholarships** to our freshman and transfer students. This has been particularly exciting as the number of new students has greatly expanded in the last several years. Without Alumni support, we would not have been able to welcome these students into the Department in such a grand style.



Alumni Scholarship winners from left **Julianne Bell, Heather Bovino, Amy Cook, Carolyn Dirnfield, Paula Feldmar, Jonathan Lam, Lauren Lew, Catherine Puccetti, Alexandra Russell, Kayla Seto, Julia Thompson, Emily Travers and Morgan Wilson** along with Alumni presenters **Margaret and Pawel Domejczyk**.

UMass at IFT

UMass Food Science enjoyed a successful IFT including **Micha Peleg** receiving a well deserved award, the **Product Development Team** reaching the finals, numerous invited talks from our faculty, several student awards and of course our always successful and highly attended **Alumni Breakfast**. To make things even better, **Dean Steve Goodwin** attended the meeting so he was able to experience firsthand the excitement of IFT, the success of our students and faculty and the role of our distinguished Alumni in the Food Industry. Below is a summary of UMass at IFT:

Micha Peleg receives IFT Research and Development Award



Micha with IFT President Bob Gravani

The Research and Development Award recognizes an IFT member who has made a recent, significant research and development contribution to the understanding of food science, food technology, or nutrition. **Micha Peleg** received this award for encouraging the scientific community and food industry to re-evaluate the methods that predict microbial inactivation and adopt a nonlinear kinetic approach to sterility calculations. Peleg's research team's more precise characterization of inactivation kinetics could reduce over-

processing of foods and help improve nutritional value and quality without sacrificing safety. (Adapted from ift.org)

On a personnel note, this is a much overdue and well deserved award for Micha. His nonlinear kinetics approach is revolutionary to Food Science and yet it has taken years to get the scientific community to recognize his innovative thinking.

Food Science Product Development Team Makes IFT Finals

For the first time in over 15 years, the **UMass Product Development Team** has made the IFT finals. Our absence is mainly due to the focus of the Department in fundamental research versus product development. However, this year we had a group of entrepreneurial students, who with little help from anyone, put together a team and developed the most innovative product in the competition. We were all extremely proud of the team as, unlike the other finalist, the UMass team took charge of their own product concept and developed all the competition material with little help from faculty. This is my idea of what a student competition should be and I couldn't be more proud of our students. Special thanks to alum **Paul Racicot** at Dunkin Doughnuts, who was able to secure some funding for the team as well as providing them with the opportunity to visit the Dunkin Headquarters to get firsthand industry experience. Below is a short synopsis of the student's project:

Why buy a coffee and a doughnut when you could buy Joe Nuts?

Joe Nuts are a new take on a doughnut hole, but instead of jelly in the middle, your mouth will be filled with delicious, warm, liquid coffee. Joe Nuts are a brilliant combination of a long-standing breakfast tradition. This doughnut hole has a liquid coffee center that oozes out as it is bitten into. Joe Nuts fuse the classic on-the-go breakfast of coffee and doughnuts into one. The distinctive liquid coffee center of Joe Nuts is formed by a process called reverse spherification. In short, reverse spherification is a process in which calcium gluconolactate is incorporated into the coffee center along with a non-dairy creamer and sucrose. The coffee solution is then dropped in small amounts into a 0.5% sodium alginate bath. The coffee solution forms a sphere upon entering the bath. The calcium ions from the calcium gluconolactate form a salt bridge between individual negatively charged alginate molecules, forming a gel complex. This gel complex is thin but strong allowing the center of the sphere to remain liquid inside. This gel is also heat stable, so upon frying, it will stay intact.



Joe Nuts are also a solid basis for an array of line extensions including many doughnut, as well as liquid center variations. Variations may include a seasonal cider doughnut covered in cinnamon sugar with an apple cider center, or a chocolate glazed doughnut with a vanilla hazelnut coffee center. Espresso, a popular café drink, may also be used as a liquid center. A kid-friendly version may be a plain doughnut with sprinkles and a liquid hot chocolate center.

Consumers will go nuts for Joe Nuts!



Product Development team, faculty and Alumni at IFT. From left Alumni **Jackie Mathews** and **Englebert Ortega**, team members **Alexis Minniti**, **Jeff Barish**, **Jay Gilbert**, **Courtney Anderson**, faculty **Eric Decker**, team member **Victoria Boushell**, faculty **Sam Nugen** and **Ferg Clydesdale**, team member **Corey Fitzgerald** and **Alison Hurysz** and faculty **Julie Goddard**. Not shown are team members **Ashley Horner** and **Victoria Sbrogna**.

Other UMass Activities at IFT

Julian McClements gave two invited presentations on “Development & Application of Food-Grade Antimicrobial Nanoparticles” and “Design, Fabrication and Application of Functional Food-Grade Lipid Nanoparticles”.

Eric Decker gave an invited presentation on “Strategies to Control Lipid Oxidation in Complex Foods”.

Julie Goddard gave an invited presentation on "Self-Sanitizing Food Processing Surfaces" in the Nanotechnology Enabled Food Safety Interventions Session.

Yeonhwa Park chaired a session on “Carbohydrate-Active Enzymes: Structure, Function, and Application”.

In the Food Chemistry Division Poster Competition Graduate Student **Tanushree Tokle** received first place for her poster entitled “Behavior of lactoferrin stabilized corn oil in water emulsions coated with anionic polysaccharides in simulated gastrointestinal tract” and **Bingcan Chen** won second place for his poster entitled “Role of phospholipids reverse micelles on lipid oxidation: Impact of minor components on physicochemical properties of stripped soybean oil”.

Pilot Plant Campaign



It is very exciting to see all the changes in Chenoweth as laboratories are both being added and renovated. However, in many ways, the Pilot Plant has not changed much since the building was built in the early 1960s. As you know, a properly equipped Pilot Plant is essential to meeting our teaching and research challenges to ensure world food safety and a healthy food supply. The Pilot Plant is an integral part of our teaching program including a sophomore-level course that teaches how food processing and ingredient technology impact food quality and safety and an upper-level course (for seniors and graduate students) that puts engineering principles into practice and focuses on food processing technology and equipment, including raw material preparation, thermal and mechanical processing, dehydration, cooling, and freezing. In addition, the Pilot Plant plays an

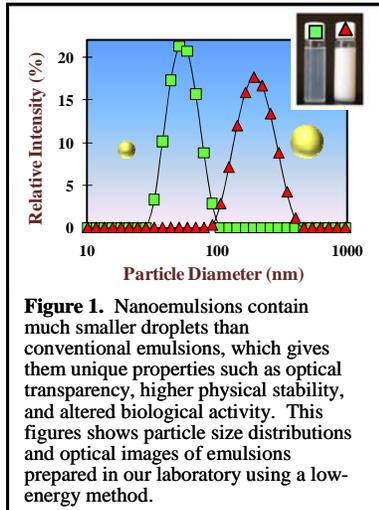
important role in research, enabling us to test bench-top technologies in real-world food processing applications. The Pilot Plant also serves as a key link between our department and the food industry as it has been a launching pad for many successful food products. The Pilot Plant is also providing members of the local food movement with the opportunity to develop the operational ability to distribute their products year round. In order to modernize our Pilot Plant we are seeking donations of modern food processing equipment. These donations present an opportunity for companies to receive tax breaks, gain brand recognition because students trained on your equipment will be the brand our alumni suggest when they make purchasing recommendations and good publicity as each piece of equipment donated to the Food Science Pilot Plant will be labeled with a plaque citing the donor. If you, or anyone you know, might have an opportunity to help us upgrade our Pilot Plant, please contact Eric Decker at edecker@foodsci.umass.edu or 413-545-1026.

Research News

The Department has received three new research grants from the National Institute of Food and Agriculture.

Influence of Nanoparticle Characteristics on Fate, Bioavailability, and Toxicity of Food-Grade Nanoemulsions

Hang Xiao; D. Julian McClements and Eric A. Decker

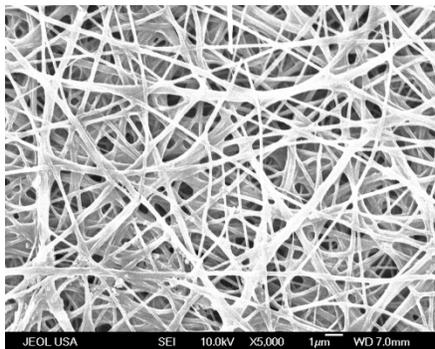


Nanoemulsions have many potential advantages over conventional emulsions for certain applications (optical clarity, increased bioavailability, enhanced physical stability), and so they are being used more frequently within the food industry to encapsulate bioactive components. However, there is increasing concern that creating ultra-fine particles in food emulsions may have adverse effects on human health. Currently, knowledge of the impact of nanoparticle characteristics on the biological fate of encapsulated components within nanoemulsions is limited. The overall objective of this project is to address this lack of knowledge by systematically examining the impact of specific nanoparticle characteristics (*i.e.*, size, charge and composition) on the bioavailability and safety of β -carotene using *in vitro* and *in vivo* models. Our central hypothesis is that the bioavailability of highly lipophilic food components can be substantially increased

by encapsulation in nanoemulsions, which could potentially cause certain dietary bioactive food components to reach tissues levels where they can exhibit toxicity. β -Carotene was selected as a model bioactive food component because: it is widely used as a colorant and nutraceutical; it normally has a low bioavailability; it may exhibit adverse health effects when consumed at high levels, which could occur when it is encapsulated in nanoemulsions.

PhD National Needs Training Grant: Applications of Nanotechnology to Improve Food Safety

Sam Nugen, Julie Goddard and Lynne McLandsborough



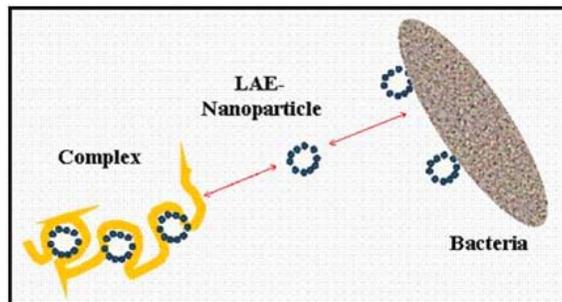
The USDA has awarded three PhD fellowships to UMass Food Science to study the potential of using nanotechnology to improve food safety. This project is in support of the National Institute of Food and Agriculture strategic goals to "Enhance Protection and Safety of the Nation's Agriculture and Food Supply" and "To Improve the Nation's Nutrition and Health". This project utilizes a unique cross-departmental curriculum in which Fellows take core nanotechnology and food safety courses, along with project specific training in microbiology, surface analysis, or

nanofabrication. The Fellows graduating from the program will provide the food industry and academia with qualified PhD food scientists who are well equipped for successful careers in improving food safety through the use of nanotechnology. This is the second National Needs

grant in the Department with the other focusing on the relationship between Foods, Health and Government Policy.

Fabrication, Characterization & Toxicology of Antimicrobial Nanoparticle Delivery Systems

D. J McClements, Hang Xiao and Lynne McLandsborough



There is an urgent need for new effective antimicrobials for use in the food industry to help prevent food borne diseases. Lauric arginate (LAE) is a food-grade cationic surfactant capable of forming antimicrobial nanoparticles effective against a wide range of microorganisms. Nevertheless, its utilization is currently limited because of its bad taste and tendency to form precipitates in products containing anionic ingredients. Studies in our laboratory indicate that the adverse effects of LAE nanoparticles on taste and precipitation can be inhibited by forming electrostatic complexes with anionic polysaccharides. Nevertheless, these complexes may reduce the antimicrobial activity of LAE, as well as retarding its hydrolysis within the gastrointestinal tract (thereby increasing potential toxicity through its impact on gut microflora). Our objective is to design antimicrobial delivery systems whose beneficial attributes (antimicrobial efficacy, low toxicity) are optimized, but whose detrimental attributes (astringency/bitterness, precipitation) are minimized.

Faculty Activities

Ferg Clydesdale: Ferg has been working tirelessly with his Policy Alliance group. The Policy Alliance activities include the Institute of Medicine publishing a book on their workshop entitled “Leveraging Food Technology for Obesity Prevention and Reduction Effort” and an article on “A Research Model for Investigating the Effects of Artificial Food Colorings on Children with ADHD” in *Pediatrics*. This paper is an excellent summary of the shortcoming of recent work linking artificial colors with ADHD. The Policy Alliance’s next meeting will be at Kraft's Washington Headquarters to discuss Food Science research funding with representatives from IOM, NIH and USDA.

Eric Decker: I had a great time working with Simon Stevenson of UMass Dining Services who does a show on public TV on food and health called “Connecting Point”. We did pieces on portion control and ice cream production. The videos can be found at <http://www.youtube.com/watch?v=KFkHdEKIENI> and <http://www.youtube.com/watch?v=sAv3LAgCeHo>. I gave an invited lecture on “Rethinking the Antioxidant Paradox” at the American Oil Chemists Society meeting and gave a plenary lecture

at the EuroFoodChem meeting in Gdansk, Poland on “Are antioxidants multifunctional food ingredients that can impact both health and food quality?”

Julie Goddard: Julie’s lab group is rapidly expanding as she welcomed another PhD student and visiting scientist into her lab to work on an active packaging project supported by Dairy Management, Inc, bringing her group to four PhD students, two postdocs, one M.S. student, a visiting scientist, and two undergrad researchers. Her student, Jeff Barish's paper, "Polyethylene Glycol Grafted Polyethylene: a Versatile Platform for Non-Migratory Active Packaging Applications" was recently accepted to the Journal of Food Science. This paper is based on work presented during Jeff's Hultin Award presentation at the SRA last spring.

Julian McClements: Julian continues to have a very large lab group with over 20 students, postdocs and visiting scholars. In the past few months he has given invited presentations including Design and Application of Functional Food-Grade Nanoemulsions at the American Chemical Society and Nanoemulsion-based Delivery Systems for Nutraceuticals” at the Design, Properties & Applications, Delivery of Functionality Conference in Guelph, Canada.

Ron Labbe: Ron gave an invited presentation at an International Life Science Institute-sponsored symposium at International Association for Food Protection. Ron continues to work as the Graduate Program Director. This is no simple task as our graduate student numbers have swelled to over 50 students.

Robert Levin: With respect to the potential of bioterrorism and the U.S. food supply, A 250 page volume on Anthrax entitled "Anthrax: History, biology, global distribution, clinical aspects, immunology, and molecular biology" has just been completed by Professor Robert Levin as sole author and has been forwarded to the publisher. Publication date is expected to be mid-2012. His work on direct PCR detection of low numbers of food borne pathogenic bacteria has culminated in a recent publication documenting the detection of E. coli O157:H7 in lettuce at a level of 5 CFU/g which represents the leading edge of this area globally. At the age of 82, professor Levin is expecting to retire at the end of the summer of 2012 after 48 years on the faculty and will expectedly resume a second career in industry.

Lynne Mclandsborough: In addition to Lynne continuing her great work as our Undergrad Program Chair, she served as the Chair of the IFT Food Biotechnology Committee and the UMass Institutional Biosafety Committee. Lynne also visited Chulalongkorn University in Bangkok, Thailand where she served on the PhD committee of Naruemon Mongkontanawat as part of the Thailand/UMass PhD Sandwich program.

Sam Nugen: The Nugen Research Group has been continuing research in the development of biosensors for food systems. This year Yuhong Wang, Shengquan Jin and Catherine Fill presented their research at IFT in New Orleans. Fei He presented her research at a Gordon Research Conference as well as the NanoBiotech Conference in Boston. In addition, Yuhong Wang presented his work at the Center for Clinical and Translational Sciences at UMASS, Worcester as well as submitting this work for publication.

Yeonhwa Park: Yeonhwa gave two invited international presentations including ‘Scientific Evidence Behind CLA: The New Nutrient Against Overweight and Obesity’ at the XVIII Congreso Argentino de Nutricion, Buenos Aires, Argentina and ‘Improving Bone Health using Bioactive Lipids’ at the Annual Meeting and Expo for Korean Society of Food Science and Technology, Daegu, Korea. She also presented ‘Conjugated Linoleic Acid from Discovery to GRAS, a 20 Year Journey’ in an IFT Webcast, served as the Chair for the IFT Food Chemistry Division and had the most-cited paper of 2008 in the Journal of Food Science in the Review section. Dr. Park’s research group presented 6 posters for Experimental Biology.

Micha Peleg: Micha continues his extremely innovative work on Wolfram Demonstrations. His newest projects include calculating the combined effect of different risks, starting from a reference risk such as that corresponding to a person's age, gender, and so on which can be seen at <http://demonstrations.wolfram.com/AdditiveAndMultiplicativeRisks/>. A second demonstration allows one to assess the effect of pressure in pressure assisted thermal sterilization of microorganism or spore in terms of time, holding temp and/or pressure treatment <http://demonstrations.wolfram.com/IdealizedConventionalAndPressureAssistedThermalPreservaionP/>.

Kali Shetty: Kali presented Plenary Lectures on "Innovations for Healthy Food Systems to Manage Diet-Linked Chronic Diseases and Advance Sustainable Development in India" at the BIEC conference in Bangalore, India and “Interface of Metabolomics & Nutrigenomics Shaped by Redox Biology to Design Functional Foods to Combat Obesity-Linked Chronic Diseases" at the 25th Annual International Conference on Practical Approaches to the Treatment of Obesity" at Harvard Medical School. Kali has presented workshops in India, Indonesia and Mongolia over the summer of 2011 on "Metabolic Strategies for Design of Plant-Based Functional Foods and Ingredients".

Hang Xiao: Dr. Xiao’s group showcased their research at the Experimental Biology meeting in Washington, DC, where Dr. Xiao chaired a symposium on Diet and Cancer. Three oral presentations and 5 poster presentations were given by the graduate students from Xiao’s group, among whom Tom Charoensinphon talked on the anti-cancer effects of 5-hydroxyl tangeretin, a unique bioactive compound found in orange, and won first place in the Graduate Research Competition. Dr. Xiao also gave a presentation in a conference hosted by the National Academy of Sciences in Dubai, UAE. Dr. Xiao gave 4 invited presentations at Universities in China this summer.



Eric Decker
Department Head