John E. Kinsella Chair in Food, Nutrition and Health
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ENDOWMENT PURPOSE
The John E. Kinsella Chair in Food, Nutrition and Health was established in 1994, after Dean Kinsella’s passing. The endowment was created using funds provided by General Foods that originally supported the late Professor Kinsella’s research in food science and human nutrition, with specific focus on the interrelationships between food, nutrition, and health. In keeping with Kinsella’s long-standing support and cultivation of junior faculty, the Kinsella Chair recognizes outstanding faculty members during the development stages of their careers.

RESEARCH
This generous endowment is instrumental in my ability to support graduate and postdoctoral scholarship and research focused on developing a comprehensive understanding of the chemistry of food in order to interpret the impact contemporary agronomic and post-harvest processing techniques have on quality and chemical food safety. This is increasingly important research, as both agriculture and food manufacturing has changed at an unprecedented rate during the 21st century, and is now a globalized endeavor. Developing a chemical understanding of contemporary food systems is critical for optimizing the quality of fresh and especially processed foods, food authentication, and is critical for improving global health.

During this past year our research efforts have focused on the following projects:

1. Bees (Apis mellifera) forage on different plants and the characteristic flavor of honey is a reflection of the nectar choice of the bee (Apis mellifera). Mono-floral honey is nectar that originates primarily from the nectar of a single plant species and possesses distinct organoleptic characteristics. honeys from a single botanical source are considered premium products and many have specific health benefits. Unfortunately, honey adulteration is common and very difficult to detect. Adulteration can involve feeding bees with sugar and/or syrups, mixing mono-floral honey with honey from a different botanical origin, or mixing the...
honey with inexpensive sweeteners such as high fructose corn syrup. During the past year, Kinsella funding has allowed us to purchase equipment and support a student to work in collaboration with the UC Davis Honey and Pollination Center to characterize the volatile profiles of a wide variety of mono-floral honeys. This exciting project will help provide a chemical foundation for identifying honey adulteration.

2. California is experiencing a severe drought. Our lab strives to support water conservation efforts by re-evaluating water intensive food processing methods and developing new approaches for processing these foods using less water. One such product is the California-style black ripe olive which requires an extensive amount of water for lye-curing and washing olives prior to canning. Kinsella funding has allowed us to continue to develop foundational data supporting the use of novel resin-based methods for debittering olive fruit under low-water conditions. Preliminary data resulted in a UC patent recently licensed by stakeholders that has potential to improve the quality/healthfulness of California-style black ripe olives in addition to improving the sustainability of this water intensive product.

3. Almonds and other tree nuts exposed to post-harvest moisture can develop a brown discoloration and off flavors with moderate heat treatment. As this damage is only apparent after the nuts are heated (e.g. roasting) it is referred to as concealed damage (CD). To date there are no screening methods available to detect CD in almonds. During this past year our lab developed a method to detect CD in raw almonds using near infrared light spectroscopy (NIR). This non-destructive method has the potential to be adapted into online screening for inexpensive monitoring of CD in raw almonds. Our laboratory is also studying the influence of drying almonds, prior to heat processing, as a tool for decreasing CD in the field. Additionally, we have been investigating the growing practice of “activating almonds” prior to consumption. Activating nuts such as almonds, involves soaking them in water overnight to promote enzyme activity and the release nutrients. To date, there is no data to support the theory of this practice and food safety issues may be a concern. Although the first two projects were largely supported by the Almond Board of California, Kinsella funding to support ancillary projects (both graduate and undergraduate students) related to these projects and to fully support preliminary investigation on activating almonds.

4. Identifying the composition of volatile compounds and amygdalin in almond samples taken from the hull of a Byzantine shipwreck (~410 AD). Amygdalin is the compound responsible for the bitterness of bitter almonds. This ongoing highly collaborative project involving archaeologists, divers and historians from around the globe. Developing sensitive enough methods to measure volatiles in ancient samples is analytically challenging. Our data will be used to better understand how almonds were traded, used, and consumed in ancient times. To date, funding to support this research has been cobbled together from variable sources including the Kinsella endowment.

5. Developing a method for the simultaneous analysis of a large range (> 40) decertified food dyes in foods. Many food dyes have been removed from use in foods because they are toxic and/or carcinogens. Unfortunately, these dyes are sometimes still used to color foods, especially spices, to make them more appealing of hide quality defects. With the globalization of food trade, and pressure to replace certified synthetic food dyes with natural colors, some decertified dyes are finding their way back into the food supply. A simple method that can achieve the analysis of multiple dyes will help support industry efforts to monitor decertified colorants in foods. This project is support solely by Kinsella funding.
TEACHING

Teaching is the most rewarding aspect of my career. I am responsible for three courses at UC Davis:

1. The Chemical and Physical Analysis of Foods (FST103): This is an upper-division core course in the Food Science curriculum. I thoroughly enjoy teaching this course, which meets three hours per week for general lectures and has four weekly three-hour laboratory sections, as it promotes one-on-one time with students. I have worked to improve the analytical capabilities of the teaching laboratory in order to raise the competency and marketability of our graduating seniors. I strive to keep lecture topics relevant and focused on addressing contemporary current needs of the industry. Food manufacturing has changed at an unprecedented rate and is now a globalized endeavor. Ingredients are increasingly purchased abroad, through brokers, and manufactured in food products in the US. This past year, I have continued to incorporate information on how analytical chemistry can be used to support global supply chain management and ingredient sourcing (e.g. validation, authentication, certificates of analysis, etc.). The students responded very positively to this new presentation of information as it links the chemistry they learn in the classroom directly to contemporary food manufacturing issues.

2. Food Toxicology (FST128): This is an upper-division course offered in both Food Science & Technology and Environmental Toxicology. This course meets three hours per week and covers basic principles of pharmacology and toxicology, animal, plant and marine toxins, toxicants arising from food processing and now, global issues in food adulteration. I continue to develop new curricula for this course to keep it dynamic. New lectures include: Global Food Sourcing & Adulteration-The Melamine Story; Food Colorants: Natural vs. Certified Dyes, and Ingredients and Additives.

3. Food, Folklore and Health (FST10): This is a large (~450-525 student), fast paced undergraduate freshman course. This course meets three hours a week and is ton of fun to teach. I strive to bring current insights into the curriculum lecturing on topics such as: Contemporary Food Movements: Industrial Agriculture, Organic Foods, Local Foods and Food & the Obesity Epidemic. Teaching a freshman course this size requires a very different approach to conveying information. I keep students engaged by incorporating videos, practice questions, pictures and humor into the lecture materials.

My teaching commitments extend far beyond the classroom and teaching laboratories. I have been very active mentoring a high school intern, several undergraduate (4 students) and graduate students (4 students), a postdoctoral scholar and a visiting scholar. I encourage my undergraduate students to present research posters at the UCD Undergraduate Research Scholarships and Creative Activities Conference and if possible local professional meetings. I am Master Advisor for the Food Science & Technology major, and advisor in the Agricultural and Environmental Chemistry and Food Science graduate groups.

STUDENTS

This past year, Drs. Suthawan Charoenprasert and Jeannie Lee were supported through the Kinsella Endowment. Suthawan is a post-doctoral scholar whose research focuses on developing HS-SPME GS/MS for identifying and quantifying volatile compounds in mono-floral honeys and in almonds. Dr. Lee’s research focuses on developing
UPLC-QTOF-MS methods for quantifying nontarget secondary plant metabolites and volatiles in almonds for varietal authentication.
Kinsella funding was also used to support the research activities of Rebecca Johnson, a graduate studying the possible use of using resins to debitter olives under low-water conditions, and the research efforts of Kathleen Lau (food dyes) and Lianna Lee (activated almonds).

OUTREACH
During this past year I have given two presentations at meetings of the American Chemical Society. I was also able to send two graduate students, Lillian Franklin and Cristian Rogel-Castillo to give poster presentations as the annual conference of the Almond Board of California.

NEW AND UNIQUE ENDOWMENT USE
During this past year we began to develop an analytical method that will allow for the simultaneous analysis of more than 40 decertified food dyes in foods and beverages. Developing this method has required purchasing each of these food dyes so that we can learn to extract them from multiple food matrices and quantify them in foods and beverages. Food companies do not usually test food ingredients for decertified food dyes. We hope to provide the industry with an inexpensive analytical tool for screening food ingredients to help ensure the safety of the foods we eat.

LEVERAGING ADDITIONAL FUNDING
Last year, Kinsella funds were used to leverage the purchase of gas chromatography system with a head space solid phase microextraction autosampler for volatile analysis through our partnership with Agilent Technologies (~80K). During this past year, 5 students have already been trained and perform research on this cutting edge equipment.

This year, we plan to leverage the purchase of high performance liquid chromatography system with a triple quadrupole mass spectrometer for target compound analysis (toxins, adulterants, bioactives) through our partnership with Agilent Technologies (~100K).

Training students on cutting edge equipment like this enhances their research capabilities and gives them a competitive edge in the job market.