Fall 2006

Features

Columns

JIFSAN impact
Joint Institute for Food Safety & Applied Nutrition

University and FDA researchers collaborate on cosmetics research

A consumer may spend hundreds of dollars on cosmetics and personal care products annually assuming these products are safe since they are on store shelves. But, cosmetic manufacturers are not legally required to obtain federal government approval before placing their products on the market.

To address one of the potential adverse reactions from using cosmetics, University of Maryland (UM) and Food and Drug Administration (FDA) researchers collaborated on a project that examined the phototoxicity of ingredients in cosmetic products. Drs. Daniel Falvey, a chemistry and biochemistry professor at the UM, Wayne Wamer and Patty Fu, research chemists at the FDA Center for Food Safety and Applied Nutrition, looked at products that were applied or injected into the skin to determine if they increase skin sensitivity to sunlight.

"Anything that you can put on your skin can absorb sunlight," Falvey said.

"In most cases that's probably not a problem. In a few cases it's possible that the sunlight can transform a normally benign material into something that might be toxic."

The research study was funded through the JIFSAN Internal Competitive Research Program. The program partners UM faculty members with FDA researchers.

Because cosmetic products and their ingredients (except for color additives) are not subject to FDA approval before they are placed on the market, phototoxic ingredients might not be detected. "In most cases, nothing much of interest happens, but there have been some historical cases where various cosmetic ingredients have caused some toxicity," Falvey said.

Falvey, Wamer and Fu also examined pigments in tattoo inks to understand how they interact with light. Because there is no universal formula for tattoo ink and the market is not closely regulated, the research team wanted to methodically look at the ingredients used in the inks to see if there was a common toxic ingredient, Falvey said.

According to the FDA Office of Cosmetics and Colors Web site, over 150 consumers reported adverse reactions to certain permanent makeup ink shades. Permanent makeup includes eyebrow, eyeliner and lip tattoos.

See *Cosmetics*, page 7


Dr. Jianghong Meng

Leadership Change

Dean Cheng-i Wei appointed Professor Jianghong Meng as the new Acting Director of JIFSAN. Dr. Maureen Storey stepped down as Interim Director of JIFSAN to devote her entire attention to the Center for Food, Nutrition and Agricultural Policy on September 1, 2006.

Meng, a professor in the Department of Nutrition and Food Science, is uniquely qualified for this position. He has had six years of internal grant support from JIFSAN and is involved with a cooperative research effort involving JIFSAN and the Department of Natural Resources and Environment of the state of Victoria, Australia.

He is a member of the National Advisory Committee on Microbiological Criteria for Foods of the U.S. Department of Agriculture, Department of Health and Human Services, Department of Defense, and the Department of Commerce.

We feel fortunate to have Jianghong in this new leadership role with JIFSAN.

Internship Column

JIFSAN intern works on FDA food defense research

Food is part of the nation's critical infrastructure and contributes about 20 percent of the U.S. Gross National Product according to reports from the U.S. Food and Drug Administration (FDA). Because terrorist attacks on the food supply could have harmful public health and economic consequences, food defense research is an area of critical importance for the agency.

Several food defense intern projects were funded through the FDA Center for Food Safety and Applied Nutrition (CFSAN). These projects are unique opportunities for JIFSAN interns to conduct research that are part of the nation's fight against terrorism, CFSAN reported.

Gregory Orlowski, a JIFSAN intern and a recent University of Maryland (UM) graduate, worked on a research study that examined the effects of food preparation on the detection of protein toxins in foods. This study at CFSAN is a part of the agency's efforts to investigate the detection of contaminates in foods, explained Dr. Eric Garber, Orlowski's mentor and a research chemist at CFSAN.

Orlowski spiked foods rich in starch, protein and complex carbohydrates with a non-toxic surrogate protein. These foods were frozen, baked and boiled. He found that baking, at certain temperatures, and boiling hindered detection of the surrogate protein, but freezing had no significant effect. Ingredients in tomato juice, uncooked pasta and soy formula had little effect on detection, but the lactose ingredient reduced detection.

This internship taught him a lot about general lab techniques, Orlowski said.

"It's important to know what to weigh very precisely and what isn't so important to experiments," he said. "A lot of it has to do with looking at the numbers."

His experience with "crunching numbers," or putting numbers into a form that allows you to make inferences from them, also helped him in his statistics and lab courses at the university, Orlowski said. "All of it was stuff that I've been doing here the last year and a half, so it gave me a lot to work with outside of the lab."

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Communication skills, critical-thinking skills and confidence are part of Orlowski's appeal, said his mentor and one of his advisors at the university. "We want somebody who you can talk with, who can express what the problems are, and is able to make good decisions," Garber said. "He came across very well in the interview in terms of somebody who thinks and could probably function on his own."

When Orlowski discovered a problem with detecting the non-toxic surrogate protein in ice cream, he independently researched and analyzed the problem to figure out whether freezing the food or the ingredient lactose was the problem, Garber said.

PHOTO COURTESY George C. Ziobro, FDA

Gregory Orlowski, JIFSAN Intern, and mentor, Dr. Eric Garber in a FDA lab.

See ***Intern,*** page 4

8th Annual CSL/JIFSAN Symposium

The eigth in a series of annual symposia on food safety and applied nutrition jointly organized by the Central Science Laboratory (CSL), UK, and the Joint Institute for Food Safety and Applied Nutrition (JIFSAN), University of Maryland, College Park will take place June 26 – 28, 2007 at the Hilton Garden Inn, Greenbelt, MD.

The conference will bring together leading scientists to present cutting-edge scientific research on nanotechnology in food, food processing, and cosmetic applications. This will culminate in a session reviewing approaches to risk assessment .

The symposium will be of interest to scientists, food industry personnel, students, educators, and others involved in this area. Registration will begin in January with a discounted fee of $350 for early registration. Refer to our website for further updates, or contact Judy Quigley at jquigley@umd.edu.

Dr. Frederick Khachik

Carotenoid research and chronic disease

Age-related diseases are the leading cause of vision impairment and blindness in the United States according to a report published by the National Eye Institute and Prevent Blindness America, an eye health and safety organization. The number of Americans with age-related eye diseases will increase and eventually double over the next thirty years as the baby-boom generation grows older.

Dr. Frederick Khachik, a JIFSAN senior research scientist and a chemistry and biochemistry adjunct professor at the University of Maryland, conducted a research study on the use of dietary carotenoids, lutein and zeaxanthin, to prevent age-related macular degeneration (AMD).

AMD occurs when the central part of the retina is damaged by years of exposure to ultraviolet light. As a result, central vision is lost over time, explained Khachik.
The disease primarily affects individuals sixty five years old and older.

Carotenoids are pigments that give vegetables their vibrant colors. Alpha-carotene and beta-carotenes give carrots their orange color and lycopene gives tomatoes their red color, Khachik said.

Because of their antioxidant ability, Khachik believes carotenoids are important in the prevention of chronic diseases, such as cancer, heart disease and retinal disorders.

The carotenoids lutein and zeaxanthin could be helpful in preventing AMD, Khachik said.

“The circulatory system carries them into the eye to the center of the retina. They protect that region from overexposure to harmful parts of visible light and small parts of ultraviolet light that gets through the lens and iris,” he said.

Acting as antioxidants, lutein and zeaxanthin protect the photosensing cells in the center of the retina from oxidizing species and light which can destroy or damage this region of the eye, Khachik said.

“Lutein and zeaxanthin also function as optical filters,” Khachik said. “In other words, they filter out the harmful part of visible and near visible light that could damage the photosensing cells.”

Eating plenty of green fruits and vegetables and other yellow-orange foods that contain these carotenoids increases the concentration of lutein and zeaxanthin in the blood.

See *Carotenoids*, page 5

CSL/JIFSAN Joint Symposium on Food Safety and Nutrition- Nanotechnology in Foods and Cosmetics

June 26, 2007

Opening Session
FDA Public Meeting- Regulated Products Containing Nanotech Materials

Legislative Aspects of nanoparticles

Nanotechnology for Food Systems – Research efforts in the US

European Framework for Exploring NT-risks

June 27, 2007

Characterization/Detection methods (physical and chemical)
Detection and Standardization Methods for Nanomaterials

Detection Methods – (SEM/TEM)

Nanotechnology and Packaging

Detection Methods

Development of Reference Materials

Routes of exposure and toxicology
Food and Environmental exposure routes of nanotechnology

Routes of Exposure-Skin penetration studies

Products and applications of nanotechnology for food and food packaging – implications for consumer safety and regulatory controls

Toxicological Impacts: Nutrition and Nanotechnology

Nanoparticles and Toxicology

June 28, 2007

Approaches to risk assessment – dealing with uncertainty
Proposed Comprehensive Framework for Systematically Exploring

Nanotechnology's Possible Risks

Are there potential safety concerns for the use of nanomaterials in food or color additives?

A European view on risk assessment of nanoparticles in food

Regulatory approach to nanotechnology-based drugs for food producing animals

Update on Nanotech and Food: Markets & Regulatory Issues

Intern, from page 2

PHOTO COURTESY Eric Garber, FDA

Gregory Orlowski, JIFSAN Intern

Dr. Lee Hellman, Director of the UM College Park Scholars Life Sciences Program said that Orlowski's confidence made him distinct among his peers.

"A lot of our students, even though they're scholars and they're pretty smart kids, feel intimidated by the subject matter or the circumstance. He was self-confident," Hellman said.

"He has knowledge of what he can do and where he wants to go. A lot of my students are still wondering what's going on in the world. He was focused when he came here and he stayed with it," Hellman said.

College Park Scholars is a living-learning program for freshmen and sophomores. Students in the program living in the same dorm, attend classes and go on field trips specific to their area of concentration within the program.

"Orlowski is an excellent example of the university and CFSAN, through JIFSAN, working together to provide students with a meaningful real-life research experience and the FDA with important research data," Garber said.

Carotenoids, from page 3

Ultimately these important carotenoids accumulate in the human macula or central retina and protect against AMD, Khachik said.

Currently, Khachik is working on a collaborative research project with the investigators at the University of Chicago at Illinois.

The study examines the effects of lycopene on prostate cancer. Patients in the early stages of prostate cancer were given lycopene supplements to see if this carotenoid would prevent or slow down the progression of the cancer.

"The level of this carotene [lycopene] in the prostate is normally very high. Therefore several studies that have examined the incidence of prostate cancer in various populations and their eating habits have suggested that lycopene may be beneficial," he said.

Previously, Khachik examined the toxicity and side effects of lutein and zeaxanthin, a supplement that can be purchased over-the-counter. "People already know that lutein and zeaxanthin may hold promise for prevention of AMD, so they're taking a lot of these supplements," Khachik said.

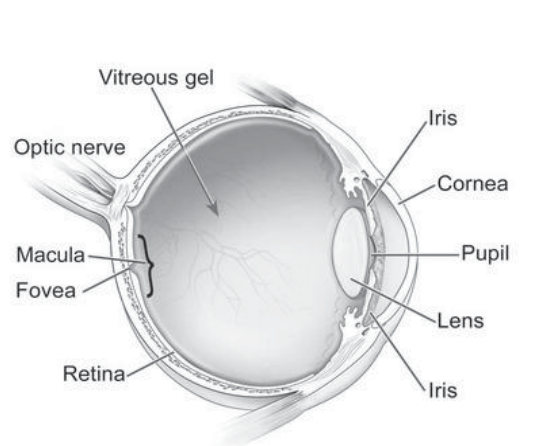

Photo courtesy of NIH Senior Health

During a four-year study, which ended last summer, eighteen monkeys were given sixty to 100 times the normal amount of lutein and zeaxanthin that would be taken as a dietary supplement. No toxicity was observed, Khachik said.

Further analysis revealed that the supplemental lutein and zeaxanthin accumulated in the retina of these animals, Khachik said. "That's the good news," he said. "That means that if you eat or take supplements of lutein and zeaxanthin, you can increase accumulation of these carotenoids in your retina which in turn protect the photosensing cells in the eye."

Although carotenoids may not be a miracle cure, research on these dietary compounds plays a role in finding preventative solutions for vision impairment, blindness and other age-related diseases.

JIFSAN employee designs UM turtle sculpture

PHOTO COURTESY Candy Kennedy

Stephanie Swartz poses beside her sculpture, *Diamonds of the Chesapeake.*

Stephanie Swartz, a student assistant in the JIFSAN business office and a University of Maryland criminology major in her senior year, was one of fifty artists in the Baltimore-Washington region selected to design a terrapin sculpture as part of the University of Maryland Fear the Turtle Project. Her design, *Diamonds of the Chesapeake*, is ranked as one of the top ten most popular terrapin sculptures on the university Web site.

The Fear the Turtle Project is part of the university's 150-year celebration. Each artist designed and painted a 4 ½-foot fiberglass sculpture. The sculptures were displayed around campus and in various locations throughout the state.

"Having something out in public that people can see is really exciting for me," Swartz said.

See *Turtle*, page 7

Partnership Column

UM Nutrition and Food Science department aids in creation of graduate food safety courses

JIFSAN expanded its food safety risk analysis courses with the help of University of Maryland (UM) departments recently. The UM Office of Professional Studies and Department of Nutrition and Food Science worked with the institute to convert food safety courses to graduate online courses.

The Department of Nutrition and Food Science expanded materials used for the food safety risk management, assessment and communication courses and made them more challenging, said Mickey Parish, chair of the department and a professor.

The Department of Nutrition and Food Science is part of the College of Agriculture and Natural Resources and offers bachelor's degrees in dietetics, food science and nutrition. It also offers master's and doctoral degrees in food science and nutrition.

Parish, who is also a member of the JIFSAN Working Group—an administrative advisory board, has completed most of the JIFSAN food safety risk analysis courses. The courses were useful, but risk analysis is still underutilized in the area of food safety, he said.

"There are so many academic programs that do not completely understand the importance of teaching risk analysis in our food safety programs to students," Parish said. "Risk analysis is a paradigm that FDA, USDA and EPA now use to make regulatory decisions, and because of that our students should understand how that works."

"There are so many academic programs that do not completely understand the importance of teaching risk analysis in our food safety programs to students."

The Department of Nutrition and Food Science also plans to expand its programs. The department plans to offer a master's degree in food systems security. The curriculum will include courses from other departments, Parish said.

"It will emphasize food safety, food biosecurity and how they are applied to the food manufacturing process," Parish said.

He emphasized the need for such a program since the 9/11 terrorist attacks.

"Since 9/11 there's been great attention paid to the potential for terrorist attacks, deliberate sabotage or non-deliberate contamination of food," Parish said.

"We need to emphasize the series of events that occur from the time that a raw commodity or ingredients reach the back door of a food processor until the final product in its final package is on the store shelves. From the time all the ingredients come in and the processing begins and you have a food product that's put into a package, it's shipped to a warehouse and shipped to a retailer … all of that needs to be investigated and addressed from the areas of food biosecurity and food safety."

Cosmetics, from page 1

People reported that the permanent makeup was associated with an array of adverse skin reactions including swelling, cracking, peeling, blistering and scarring.

Falvey, Wamer and Fu also conducted a study on cosmetic ingredients derived from aloe vera. One of the ingredients, after exposure to light, generated singlet oxygen which is a super charged form of oxygen. Some chemical compounds absorb sunlight and put that energy into surrounding oxygen molecules. Then the supercharged singlet oxygen can damage DNA and cell membranes, Falvey said.

They found that aloe-emodin, a chemical compound derived from aloe vera, can make singlet oxygen when it absorbs ultraviolet light. However aloin A, a structurally related compound contained in aloe vera, does not make singlet oxygen and could actually act like a sunscreen, Falvey said.

"There wasn't any significant activity when it interacted with ultraviolet light," Falvey said. "It takes the light and converts it to heat."

Most products contain a mixture of aloe-emodin and aloin A. "The aloe-emodin is making singlet oxygen but the aloin A is probably just absorbing the sunlight and kind of interfering with the ability of aloe-emodin to catch the sunlight and do its damage," said Falvey. "If there's enough aloin A in these formulations they're probably not going to turn out to be very harmful."

The findings from the study are useful to FDA and other researchers who can use this information in other studies on living systems in animal models and to look statistically at what happens in humans, Falvey said.

Turtle, from page 5

"Everyone gets to see my work. That's the best part."

The *Diamonds of the Chesapeake* design focused on Swartz's affection for Annapolis and the surrounding area by incorporating a mix of sea creatures and architecture. The turquoise turtle wears a crab mask, the Chesapeake Bay Bridge on his abdomen and fish on his arms. He bears the Thomas Point Shoal Lighthouse on his left leg and the Statehouse dome on his right leg. His metallic gold shell features a brown boat helm with a sphere of the state flag in the center.

"The Chesapeake Bay and fishing are things that I'm interested in," she said.

For two months, Swartz spent thirty hours painting the 100-pound sculpture. The most difficult part was painting the buildings, she said.

"I'm not used to painting buildings and things that have to be exact," Swartz said. "I usually paint things in nature like scenery. That was a challenge. The bridge was really hard for me."

Swartz's sculpture was displayed at the Chesapeake House Welcome Center on Interstate 95 until September. The university auctioned thirty-three terrapin sculptures, including *Diamonds of the Chesapeake*, on October 19 at the Samuel Riggs IV Alumni Center to raise money for student scholarships.

"Diamonds of the Chesapeake"

PHOTO COURTESY Candy Kennedy

PHOTO COURTESY Candy Kennedy

Meetings

CSL/JIFSAN Joint Symposium
June 2007

Advisory Council
Spring 2007

Training

Distance Learning
Overview of Risk Analysis
January 2007

Food Safety Risk Management
March 2007

Risk Communication
June 2007

Food Safety Risk Assessment
September 2007

Qualitative and Quantitative Methods in Food Safety Risk Assessment
December 2007

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