



New Functional Foods To Fight Cancer, Other Diseases

New, delicious tomato sauces, juices, and soups enriched with soy will be created under a \$1.27 million grant from the USDA

When Professor Mark Failla, chair of the Department of Human Nutrition, came to Ohio State, he planned to escalate the war on cancer and chronic diseases. Working with two prominent Ohio State professors, he is doing as promised. Just a year after his autumn 2000 arrival, he, Professor Steve J. Schwartz, and Professor Steven K. Clinton have received a \$1.27 million grant from the USDA under the Nutritional Impact of Functional Food Initiative. The three principal investigators have assembled a team to create and test nutritionally enhanced foods made from tomatoes and soy.

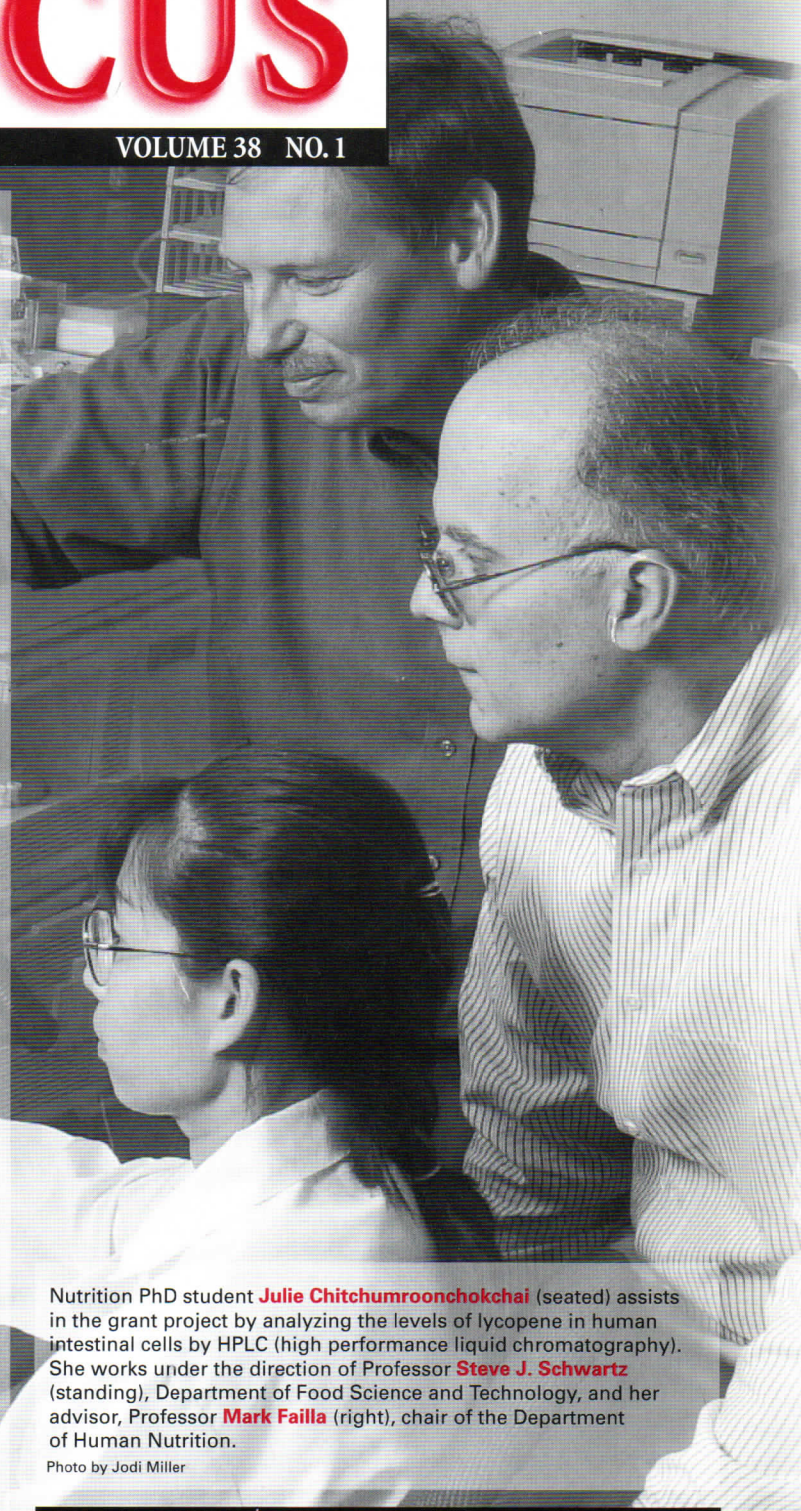
“Recent research suggests that the beneficial health effects of diets rich in vegetables and fruits most likely result from the concerted actions of diverse chemical compounds and nutrients rather than the activity of any single compound from a specific food,” Failla says. “An increasing number of investigators report that the ingestion of individual soy and tomato products appears to decrease the risk of cancer and cardiovascular disease. Our project team will develop novel products that combine these two foods in a manner that is both pleasing to the taste of the typical consumer and enriched in the levels of health-promoting substances.”

The Team Approach to Advances in Health

During the 3-year project, Professor Schwartz, Department of Food Science and Technology in the College of Food, Agricultural, and Environmental Sciences, will direct the activities of the multidisciplinary team. The three principal investigators chose team members for their unique strengths. For instance, Assistant Professor **Dave Francis** of the Ohio Agricultural Research and Development Center facility in Wooster, OH, will contribute to the team by selecting several varieties of tomatoes he has grown. Each contains different types and amounts of the bioactive compound lycopene.

Assistant Professors **Yael Vodovotz** and **Jeannine Delwiche**, faculty in Food Science and Technology, have expertise in refining the physical, chemical, and sensory characteristics of food products. They will process the tomatoes into juices,

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Nutrition PhD student **Julie Chitchumroonchokchai** (seated) assists in the grant project by analyzing the levels of lycopene in human intestinal cells by HPLC (high performance liquid chromatography). She works under the direction of Professor **Steve J. Schwartz** (standing), Department of Food Science and Technology, and her advisor, Professor **Mark Failla** (right), chair of the Department of Human Nutrition.

Photo by Jodi Miller

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soups, and sauces and add different preparations of soy enriched with isoflavones, which are a family of compounds believed to promote health. Then they will assist Schwartz in examining the impact of processing on the levels of resulting lycopene and isoflavone compounds. Lycopene and some of the isoflavones present in foods have been reported to reduce cancer cell growth or promote natural cell death *in vitro*.

Human Nutrition Chair's Unique Contribution

Failla will lead efforts to screen the stability and bioavailability of the lycopene derivatives and the isoflavones in the developed foods by using *in vitro* procedures developed in his laboratory. His models simulate the human digestion and absorption processes and will provide information about how the various methods of food processing and preparation, as well as the digestion process, will impact the amount of healthy compounds that can be absorbed from a single serving of the test product.

Failla has used these models in previous studies to examine the bioavailability of carotenoids, such as β -carotene and lutein, from fresh and processed vegetables, and the bioavailability of iron from plant, animal foods, and supplements. "We expect to learn if the combination of the soy and tomato products influences the body's ability to absorb the bioactive compounds from the created food," Failla says. "This information is important in evaluating the health-promoting value of the food."

Failla will also use the human intestinal cells maintained in his lab to prepare extracts of compounds "absorbed" from the digested tomato and soy products. Assistant Professor **Josh Bomser**, Department of Food Science and Technology, in collaboration with Dr. Clinton, will take these extracts and apply them to normal and cancerous (tumorigenic) cells to assess how they affect growth and metabolism. The study's unique achievement will be to establish whether these compounds or their metabolites in combination are more effective in reducing cancer risk than as single foods.

Human Clinical Cancer Studies

Professor **Steven K. Clinton**, MD, PhD, is a medical oncologist and Director of Molecular Carcinogenesis and Chemoprevention at the OSU Comprehensive Cancer Center. He will use the research data generated by the project to design clinical studies for patients with prostate and other types of cancer. Products with superior sensory and biological properties will be tested by Dr. Clinton, who will direct subject recruitment and evaluation of the actual absorption of the lycopene and isoflavones, as well as effects on cancer progression.

Dr. Clinton smiles broadly as he discusses the possibility that one or more of the products developed may eventually be used as part of national studies for the prevention or treatment of prostate and other cancers.



Nutrition PhD student **Kelly Walsh** changes the media of caco-2 colon adenocarcinoma cells that are used as a model for absorption in the study. These cells are originally from human colon cancer cells that differentiate *in vitro* to act like human small intestinal cells. "Dr. Failla chose them because they make an excellent model for absorption and bioavailability studies," Walsh says.

Market Share Forecasting and Consumer Education

Assistant Professor **Neal Hooker**, Department of Agricultural, Environmental and Developmental Economics, College of Food, Agricultural, and Environmental Sciences, brings his considerable expertise in economics to the project. He will forecast the growing market share for the developed functional food(s) and determine the influence of product labels and promotional campaigns on consumer perceptions and acceptance of the products. This information is needed for developing commercial marketing recommendations. Finally, the OSU Extension unit in the Department of Human Nutrition will develop

and implement a program to educate consumers, health professionals, and food industry stakeholders on the importance of soy and tomato-based foods in a healthy diet.

Graduate Students Gain Top Research Experience

Graduate students **Julie Chitchumroonchokchai** (p. 1) and **Kelly Walsh** have a valuable opportunity to learn as part of this project. Walsh, who graduated summa cum laude in Dietetics, is now a first year student in the OSU Nutrition PhD Program. He will be responsible for screening the food products to assess whether the health-promoting compounds are stable during the digestion process and if they will be absorbed, Failla explains. The student is already experienced in using Failla's *in vitro* digestion and cellular model. He recently completed a digestion and cellular investigation of the isoflavones present in a serving of soy bread, a new functional food created by Vodovotz.

"This is a unique opportunity for me because I will be examining the entire process," Walsh says, "starting with *in vitro* digestion of the foods, followed by presenting cells with the aqueous phase of the digested food. We'll examine

cellular uptake, metabolism, and absorption of these compounds."

Walsh will also work with Dr. Clinton on the cancer studies using the products that ranked highest in ideal nutritional composition and sensory properties. He will assist in recruiting subjects, conducting the feeding study, and analyzing the samples.

This project aims to create soups, sauces, and juices that can carry the FDA-approved claim that consuming them is associated with a lower risk of prostate and other cancers. It is a long awaited breakthrough. 🌸

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