



# Research

Faculty of Agricultural and Environmental Sciences  
McGill University

The field of food science is constantly evolving, developing solutions for processing and analysis, new product development and, most importantly, consumer protection. McGill's Faculty of Agricultural and Environmental Sciences is at the forefront of food and nutrition research. Researchers are combining their knowledge and skills to develop new technologies in enzymology, biotechnology, metabolomics and engineering to continually address these needs. This second edition of the Faculty's research newsletter highlights some of our advances in this integrated approach to food safety and product development.

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## Let food be your medicine and medicine be your food (Hippocrates, 400 BC)

Canada is renowned for its bountiful, healthy and safe food supply. With rising health care costs, increased life expectancies and the ever-present threat of bio-terrorism, more Canadians are concerned with their health and the safety of the food supply chain. As food companies strive to reassure the public on the safety and traceability of their products, a multidisciplinary team of researchers at the Macdonald Campus of McGill University is responding to this demand, with exciting new discoveries in nutraceuticals and food safety.

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*"He that takes medicine and neglects diet, wastes the skills of the physician."*  
(Chinese proverb)

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Dr. Stan Kubow's research assistant, Behnam Azadi, is working in the cell culture facilities at the School of Dietetics and Human Nutrition in testing the antiproliferative effects of kefir-fermented milk products on ovarian cancer cells.  
PHOTO: STAN KUBOW



Soybean grown to naturally increase isoflavone and flavone levels. PHOTO: PHILIPPE SEGUIN

Fermentation is one of the oldest methods of preserving milk products. In recent years a variety of health benefits of fermented products have also been noted. Together with his collaborators, **Stan Kubow** is studying the antiproliferative effects of kefir-fermented milk products on types of drug-resistant ovarian cancer cells. He is also investigating other milk-based nutraceuticals produced via high pressure processing, which could be used for their improved anti-inflammatory and anti-oxidative properties.

With his main focus in enzymology, **Selim Kermasha** is involved with several industry-funded projects to use microbial enzymes to manufacture value-added

products for the nutraceutical and bio-ingredients markets. The ability to industrially produce powerful phenolic lipids using natural processes is very exciting for manufacturers and consumers who are concerned about using their synthetic counterparts.

Naturally occurring in plants such as red clover and soy, isoflavones and flavones have received great praise for their therapeutic effects on health conditions ranging from cancer to menopause. **Philippe Seguin's** research focuses on how to naturally stimulate these plants into increasing the amount of flavonoids they produce. His findings will increase the cost effectiveness of growing, harvesting and extracting these valuable bio-ingredients.



### EVERYTHING OLD IS NEW AGAIN

KCLM Research in Nutrition Inc., a spin-off company of McGill University, uses patented work with an ancient microbial culture known

as kefir. Kefir-based products such as yogurts and drinks have existed for centuries, whereas their therapeutic, preventive and even curative effects are only now coming to light.

Research at KCLM has reached the clinical studies stage. The company, headed by president Robert Janody and lead researcher Stan Kubow, is looking at the effects of kefir-based products on chronic fatigue and the reduction of chronic pain, providing an effective, natural choice for symptom relief. KCLM has benefited from financial support from the Fonds Bioalimentaire, Lodial Capital and the Centre québécois de valorisation des biotechnologies.

## Focus on Researchers



**Stan Kubow**  
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**Selim Kermasha**  
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**Philippe Seguin**  
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**Ajjamada Kushalappa**  
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**Ning Wang**  
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## Quality is never an accident; it is always the result of an intelligent effort (John Ruskin, 1819-1900)

All living organisms produce metabolites. The identification and analysis process of these compounds is known as metabolomics and is of particular interest to **Ajjamada Kushalappa** for his technology development in determining food quality and spoilage. Using gas chromatography and mass spectrometry, Kushalappa has a technology capable of detecting spoilage/disease during storage, for a variety of food produce such as potatoes, mangoes, carrots and apples.

With growing concerns about food quality and safety, monitoring of our food supply chain is of greater concern to consumers and “food professionals.” Full knowledge of product quality and traceability from field to shelf is required. **Ning Wang’s** research team is developing technologies on “e-eye,” “e-nose” and “e-tongue” that can “see,” “smell” and “taste” products automatically and continuously to ensure food quality and safety. Wang’s research has benefited from state-of-the-art infrastructure funded through the Canada Foundation for Innovation (CFI) program.

In response to increasing consumer demand for “fresh” and “safe” products, **Michael Ngadi** has one of the most advanced research programs in Canada on emerging non-thermal technologies, namely pulsed electric fields (PEF), ultraviolet (UV) and ozone. Using these technologies, it has been possible to inactivate pathogenic bacteria such as *E. coli* and *Salmonella* species in a variety of food products, without sacrificing their fresh-like qualities. This facility was developed partly with funding from CFI and the food industry.

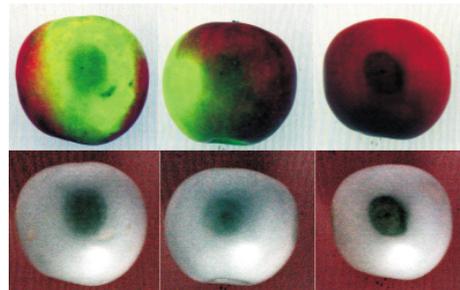
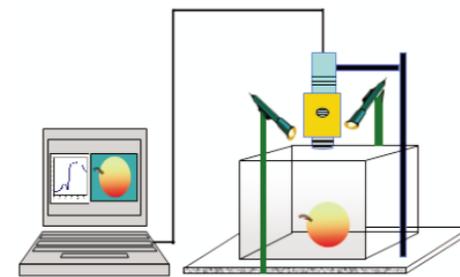
In our new age of a “global village” and with many foods entering Canada from around the world, government agencies will be in need of rapid techniques to monitor the safety of these products. **Ashraf Ismail** and his collaborators are working to develop a simple and cost-effective means of detecting pathogenic bacteria such as *E. coli* and *Salmonella* species in agricultural products. Using Fourier transform infrared (FTIR) spectroscopy, Ismail is able to “fingerprint” and thereby detect suspect bacteria in a



State-of-the-art food processing research facility.  
PHOTO: H. RAMASWAMY

given sample.

Innovative processing methods and equipment are at the heart of food safety and novel nutraceutical development. Thanks to \$4 million from CFI, McGill’s departments of Bioresource Engineering (Professor **V. Raghavan**) and Food Science (Professors **H. Ramaswamy** and **A. Ismail**) are able to set up a state-of-the-art food processing facility known as Innovative Food Processing Technologies. This facility houses new equipment for ultra high pressure processing, FTIR process monitoring, microwave-assisted extraction and microwave-assisted drying, providing a showcase of modern preservation of food technology and ensuring health and safety for consumers.



Early bruise detection using hyperspectral imaging.  
PHOTO: NING WANG

