

Committed to  
Agriculture  
and Agri-Food

# Research

UNIVERSITY  
of GUELPH

CHANGING LIVES  
IMPROVING LIFE



## RESEARCH HIGHLIGHT

Prof. Vern Osborne and graduate student Carolyn Borsy are fortifying livestock diets with beneficial bioactive compounds that can be passed on to consumers.

## Society, industry benefit from research connections

**Challenges facing society have become more complex and global in nature.** Problems — and opportunities — facing agriculture and food, health, the environment and communities everywhere require new levels of cooperative research.

**Working together is vital.** At the University of Guelph, agriculture and agri-food researchers are uniquely poised to connect with provincial and federal departments and granting councils, as well as business, industry and Canada's largest commodity groups.

**Primary producers and processors value investments in research above all.** In agriculture, new knowledge travels from the lab to the field efficiently and effectively. That makes the economic, environmental and social benefits of research readily available.

**Inside these pages are highlights of the University of Guelph's commitment to agriculture and agri-food.** Guelph's record and breadth of research, innovation and commercialization supports Canada's position as a valued exporter and consistent producer of safe, affordable food.

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## RESEARCH HIGHLIGHT

What role does the bacterial community in the human digestive system play in Inflammatory Bowel Disease? That's one of the questions facing Prof. Emma Allen-Vercoe.

- The Human Nutraceutical Research Unit at the University of Guelph serves both campus and industry partners as the go-to service for a variety of nutrition-related clinical trials. It helps **substantiate health claims for foods**, and supports companies as they seek to obtain the product licences required to sell natural health products (i.e., vitamins, minerals, herbals, supplements, etc.) in Canada.
- An increasing number of fermented dairy products are becoming available, mostly as a result of increased consumer awareness of their health benefits. Researchers are looking at **fermentation technology** to understand how and why it affects health in order to enhance a new generation of foods with increased preventive, and perhaps even therapeutic, properties.

- New food-related research could change the future for children who suffer from egg allergies, thanks to Guelph researchers who have **developed egg-derived peptides**. The researchers isolated the exact amino acid sequence responsible for triggering an allergic reaction to egg. This sequence, contained in the peptides, was fed to mice born with an egg allergy. After six weeks of ingesting the egg peptides, up to 80 per cent of the mice were able to consume the complete protein without experiencing any allergic reactions.
- Researchers are manipulating and modifying plant genes and enzymes to **produce healthier starches**. These so-called “resistant” starches resist digestion, so their sugars aren't absorbed as rapidly into the body. As a result, they help to reduce the risk of Type 2 diabetes, because less sugar is released into the bloodstream. Ultimately, these resistant starches would be incorporated into people's everyday diets, through foods such as baked goods.

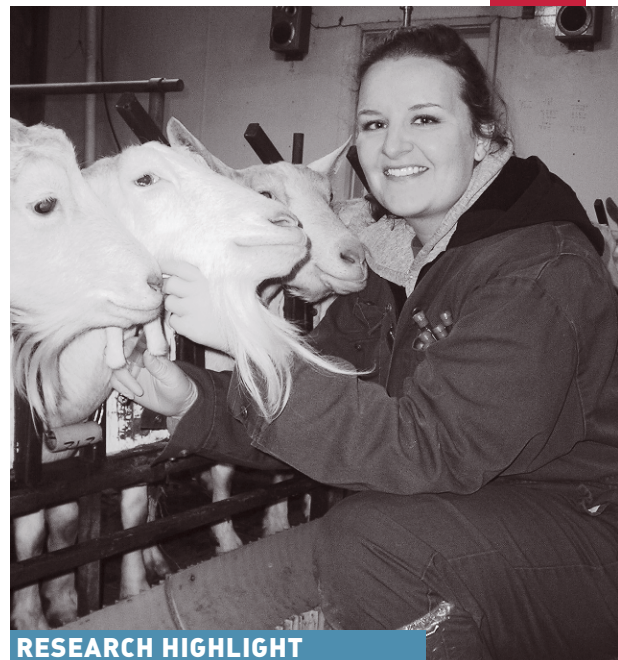
# red wheat berries f disease detection in bioproducts local fo

- A new analytical tool, the gluten peak tester, has been developed for testing **protein quality in wheat**. Gluten properties are considered the best indicator for determining wheat's end-use application (pastry, bread, etc.). A tool that can determine these properties during the early stages of a wheat breeding program helps breeders with selection. It also assists millers, who are able to identify flour quality and then deliver the appropriate flour to processors.
- An accurate and affordable soil test is being developed to help grain farmers everywhere determine how much nitrogen-containing fertilizer to apply to their fields. Researchers engineered **specialized strains of bacteria**, called biosensor bacteria, which glow in response to soil nitrogen. They inserted the glowing and fluorescent genes found in fireflies and deep water jelly fish into bacteria that respond to nitrogen in their environment. These special strains are added to soil samples to quantify their nitrogen content.
- Animal and Poultry Science researchers are using **infrared cameras** (similar to those used in medical testing) to assess cattle's feed efficiency—their ability to convert food into growth and weight gain. The researchers say the novel use of infrared cameras on farms could improve the way producers identify their most feed-efficient cattle, and, as well, make their herds more environmentally friendly by determining how much heat and methane the animals release from their bodies.



# fermentation beans allergies ultimate tomato honeybees infrared cameras vaccines influenza ragweed omega-3 food cow comfort resistant starches biosensor bacteria

- Researchers are developing a research program to help producers make the right management decisions for dealing with Western Bean Cutworm, a **highly destructive corn and soybean pest**. Its emergence is being evaluated as a possible consequence of climate change, with the insect itself impacting yield and quality. Monitoring revealed that this is an increasingly problematic pest, and that the industry needs to pursue proactive management decisions.
- Researchers in the School of Environmental Design and Rural Development are heading a new research program to help **struggling rural municipalities cope with economic decline**. The team plans to develop a “how to” manual to identify and explain best practices for ailing municipalities as well as to highlight success stories of other rural areas and provide approaches to improve local conditions.
- Clinical mastitis commonly results in reduced milk yield and increased somatic cell count. But there’s another effect that is yet to be quantified – that is, pain for the animal. University of Guelph researchers are learning more about the sensory aspects of udder infection, through a two-year research project focused on objectively measuring the pain associated with mastitis. As **animal welfare issues in food animal sectors** continue to receive more attention from both media and consumers, research focused on cow comfort will provide valuable knowledge for the dairy industry.
- The sheep and goat sectors are rising to new heights as Canada’s population continues to diversify, and tastes become more multicultural. At Guelph, researchers are studying producers’ **concerns with food-borne and zoonotic diseases** associated with sheep and goat farms and products. They want to know which diseases producers experience most frequently among their herds and flocks. Food-borne and zoonotic diseases that could be of concern include Q-fever, *Salmonella*, *E. coli* and *Campylobacter*, which are harmful to both human and animal health.
- Consuming whole-grain foods made from red wheat currently means sacrificing flavour for the sake of health benefits. The culprits are the astringent and bitter notes inherent in red wheat. Researchers are looking at how people react to these traits to help find a **balance between health and taste** in future whole-grain products.
- Beans, known as an almost **perfect food**, are having their genetics analyzed to discover the relationships between the antioxidant composition of dry beans, the genes that regulate the synthesis of these bioactives, the activities of the enzymes involved in their synthesis, and their promotion of human health.
- Researchers in Food, Agricultural and Resource Economics are helping policy-makers—and ultimately growers—**navigate the new green economy** by modelling the impacts of a projected increase in demand for corn and soybean crops related to a push for bioproducts.



## RESEARCH HIGHLIGHT

Q Fever, a zoonotic disease that can be passed from livestock such as goats and sheep to humans, is under study at the farm level by University of Guelph researchers.

- A U of G researcher has discovered the Varroa mite is the main culprit behind the **mysterious die-offs of honeybee colonies** that have alarmed beekeepers, crop growers and the general public over the past three years. The researcher is using genetic techniques to learn more about honeybee infections and to help breeders develop better bees.
- University of Guelph scientists have made a discovery that may lead to **more effective vaccines** to protect poultry and humans from the H5N1 avian influenza virus. The team has found one of the molecular determinants of the H5N1 avian influenza virus that can induce immune responses in chickens.



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Research technician Renu Chandra (front), graduate student Julieta Correa and Prof. Gopi Paliyath are studying the anti-inflammatory properties of Ontario-grown berries.

- There are numerous efforts promoting increased consumption of local food for health, environmental and community development benefits. But how do farmers perceive this **local food movement**? Researchers in the School of Environmental Design and Rural Development are talking to producers to find out which programs, policies and initiatives have encouraged them to sell to the local market, and what new policies are needed to expand producers' involvement in the local food system.
- As the **demand for bioenergy** increases, researchers in the School of Environmental Sciences are creating a tool to assess and manage potential environmental impacts. Once completed, this model will inform and assess bioenergy policies and provide direction for research.

- Timing is everything when it comes to optimizing a **corn crop's yield**, researchers have found. Recent research has shown there is a 30-bushel "yield kick" by spraying herbicides once, at the three-to-four leaf stage.
- The 2010 Ford Flex has interior parts made from **wheat-straw-reinforced plastic**, using technology that was created as part of the Ontario BioCar Initiative involving scientists at Guelph and the universities of Toronto, Waterloo and Windsor.
- Lycopene, a powerful antioxidant found in tomatoes, is being bumped up in new varieties being developed at the University of Guelph's Ridgetown campus. The research team's goal is to create the **ultimate tomato** for processing (for ketchup, tomato sauce and tomato paste). New varieties will benefit farmers' bottom line, and exceed consumers' nutritional expectations for tomato products.
- Plant Agriculture researchers have found a giant **ragweed biotype** that is showing resistance to the popular herbicide glyphosate. The researchers are conducting further greenhouse and field trials on the weed biotype to confirm resistance, as well as to identify potential management options. Researchers will also be working to understand the genetic and biochemical basis for resistance.
- To increase consumer options in the grocery store, a team of researchers at the University of Guelph is working to **enrich pork with omega-3**. By feeding flaxseed oil to young pigs, these researchers have already shown that about 70 per cent of ingested omega-3 fatty acids are retained in each pig.
- **Disease detection** in livestock may soon be encapsulated in a plastic monitoring device that emits a wireless signal, or telemetric bolus, giving farmers a computerized, non-invasive look at what's going on inside their animals. Researchers at the University of Guelph have used this diagnostic tool to detect common illnesses even before clinical symptoms appear.
- With the global market for **therapeutic antibody drugs** rapidly expanding, researchers in the School of Environmental Sciences have shown that genetically modified plants are an alternative for large-scale production of therapeutic antibodies.
- Plant Agriculture researchers are developing **environmentally friendly industrial fibres** from conventional crops such as corn and soybeans to include in composite materials for auto parts manufacturing, as well as protein isolates from wheat, soybean and dry beans for manufacturing food packaging, paper coatings and bandaging materials.
- Food Science researchers are finding ways to produce healthier meat products by replacing traditional saturated animal fat with novel and feasible alternatives such as **organogels**. Organogels consist of an organic liquid, such as a highly unsaturated vegetable oil, trapped in a gel network. They have a texture similar to saturated fats.
- Researchers responding to the 2009 human novel H1N1 pandemic are establishing an **influenza surveillance system** for Ontario finisher pigs. By testing saliva samples from privately owned pigs, the team will assist producers in determining whether the novel H1N1 virus is in pigs, so public health officials can put the role of pigs in perspective.