OMAFRA – University of Guelph Partnership

Volume XXIV Number 2 Summer 2009

Research magazine

2009 Agri-Food Yearbook Edition

Keen on green

Prof. Amar Mohanty sets his sights on developing biomaterials from biomass. The source? **Ontario farms.**
See story on page 23

Highlighting the partnership for research, laboratory and veterinary programs between the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) and the University of Guelph

Ontario

University of Guelph

Changing Lives Improving Life

Welcome to *Research* magazine's first **Agri-Food Yearbook.** In these pages, you'll find an exciting collection of highlights from the research and services partnership between the Ontario Ministry of Agriculture, Food and Rural Affairs and the University of Guelph.

Through this unique collaboration, truly amazing research is underway to help improve our food, health, and environment. Together with training and laboratory programs such as animal disease surveillance and food testing, innovations evolving from this research partnership help make Ontario's agri-food sector more competitive at home and abroad.

We are pleased to share this magazine with researchers, students and the agricultural community, and trust you find it an enlightening read. We are convinced the partnership has a vital role in strengthening the provincial economy now, and in the coming years.

HON. LEONA DOMBROWSKY
Minister of Agriculture, Food and Rural Affairs

ALASTAIR J. S. SUMMERLEE
President and Vice-Chancellor
University of Guelph

PHOTO: GRANT MARTIN

Research magazine

uoguelph.ca/research
Volume XXIV Number 2 Summer 2009
Focus: OMAFRA-U of G Partnership

Vice-President (Research)
Kevin Hall

Associate Vice-President Research (Agri-Food and Partnerships)
Richard D. Moccia

Associate Vice-President (Research Services)
Steven N. Liss

Editor and Director, Research Communications
Owen Roberts

Editorial Advisor
Liz Snyder

Associate Editor and Project Co-ordinator
Sarah Van Engelen

Research Analyst – Partnership Liaison
Robyn Meerveld

Copy Editor
Stacey Curry Gunn

Design
LINDdesign

Address correspondence to:
Owen Roberts, Director, Research Communications
Office of Research, Room 437, University Centre
University of Guelph, Guelph, ON N1G 2W1
519-824-4120 ext. 58278
rcinfo@uoguelph.ca

University of Guelph student research-writing activities are supported by:

Pioneer Hi Bred Ltd. (founding sponsor)
Advanced Foods and Materials Network
Association of Faculties of Medicine of Canada
Canadian Foundation for Innovation
Canadian Farm Business Management Council
Canadian Poultry
Dairy Farmers of Ontario
Guelph Mercury
Guelph Partnership for Innovation
Monsanto Canada (DEKALB Seeds)
Ontario Beef Farmer
Ontario Cattlemen's Association
Ontario Corn Producers
Ontario Dairy Farmer
Ontario Hog Farmer
Ontario Ministry of Agriculture, Food and Rural Affairs
Ontario Poultry Farmer
Ontario Soybean Growers
Ontario Wheat Producers' Marketing Board
SHARCNET
Soy 20/20
Syngenta Crop Protection Canada
TD Canada Trust

Publication Mail Agreement Number 40064673

Please return undeliverable Canadian addresses to:
Room 437, University Centre, University of Guelph
Guelph, ON, N1G 2W1, Canada

Printed at Sportswood Printing, May 2009
ISSN 0841-9493

Cover Photo: Martin Schwalbe

Highlighting the partnership for research, laboratory and veterinary programs between the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) and the University of Guelph

Ontario

University of Guelph
Changing Lives Improving Life

Contents

Volume XXIV Number 2 Summer 2009
OMAFRA-U of G Partnership

Ontario

University of Guelph
Changing Lives Improving Life

Contributors

The University of Guelph *Research* magazine is written and co-ordinated by students involved in the university's Students Promoting Awareness of Research Knowledge (SPARK) program.

Partnership

is the theme of this edition of *Research* magazine. SPARK writers past and present were tapped for stories about the wide variety of research and innovation at the University of Guelph's campuses, research stations and laboratories, supported by the partnership between the Ontario Ministry of Agriculture, Food and Rural Affairs and the University of Guelph.

DAVE PELESHAK

Soybeans and corn were always considered traditional commodities by fourth-year toxicology and marketing management student Lindsay Brown, who was raised on a dairy farm near Walkerton, Ont. She now sees how these commodities are also being used to make renewable materials. Her story about agricultural crops being integrated into automotive parts is on page 21.

DAVE PELESHAK

In her former life as a flight attendant, Guelph native Arpana Chakravarty, a third-year economics student, gave extra care to passengers with special health conditions, such as asthma. But this respiratory problem is not restricted to humans – horses suffer from similar conditions. See Arpana's story about treatment options for asthmatic horses on page 15.

HAYLEY MILLARD

Arthur Churchyard, a fourth-year arts and sciences student from Guelph, Ont., is keen on environmental studies. He started U of G's Sustainability Day, which involved more than 150 volunteers and 35 community groups. Arthur writes about the problems with high bacteria levels along the Great Lakes shorelines in Ontario on page 25.

ANDREA HRUSKA

SPARK co-ordinator Hayley Millard became interested in the food economy while completing her Bachelor of Commerce degree at the University of Guelph. She's learned that to meet consumer demand, the agri-food industry provides consumers with produce even outside traditional growing seasons by procuring imported foods. This has sparked a counter-movement – the local food movement – which Hayley, a native of Oakville, Ont., writes about on page 24.

ANDREA HRUSKA

Paulo LaBerge is the first SPARK writer to contribute from the University of Guelph's Ridgetown Campus. Originally from Mississauga, Ont., this first-year bioresource management student is majoring in environmental management. He writes about a creative option to protect organic crops from weeds on page 22.

DAVE PELESHAK

Fourth-year public management student Kaitlyn Little of St. George, Ont., knows the importance of understanding consumers' views and attitudes about new products, such as antioxidant foods that have beneficial health properties. Check out her story on developing healthier Ontario fruit varieties on page 12.

DAVE PELESHAK

Growing up on a cash-crop farm outside Brigden, Ont., agricultural business graduate Kyle Maw learned the value of reliable farm equipment … and the value of research, such as the concerted international effort now under way to prepare for Asian soybean rust. Kyle writes about this research on page 29.

HAYLEY MILLARD

Fourth-year marketing management student Ashley Morin, who comes from Waterdown, Ont., writes about air quality concerns in poultry facilities. She reports that pollutants, such as ammonia, are now deemed toxic by the Canadian Environmental Protection Act. Check out her story about the research being done to manage this animal and human health problem on page 27.

HAYLEY MILLARD

Katharine Tuerke, a psychology and toxicology doctoral student from Oshawa, Ont., writes that even though contaminated water can be harmful, it can be used for certain activities, such as irrigation practices that might not necessarily require potable water. Read Katharine's article about reclaimed water and its uses on page 26.

DAVE PELESHAK

Having been raised on a hog- and cash-crop farm in Thedford, Ont., Sarah Van Engelen knows that farmers are looking for a competitive edge in the food industry. An agricultural science graduate who coordinated the editorial portion of this yearbook, Sarah writes about researchers who are working to bring omega-3 pork to grocery stores. See her story on page 10.

A Legacy of Innovation

For 125 years, the University of Guelph and the Ontario government have worked together to support, and help shape, the future of the province's agri-food industry. From the early development of improved farming techniques to new sources of bioenergy today, the partnership's legacy of innovation has meant more economic activity, stronger environmental protection and improved animal and human health in Ontario and around the world. Having the long-term funding required to build a critical mass of expertise is one of the keys to the partnership's vitality and productivity, along with a unique combination of highly skilled people, equipment and facilities.

The people of Ontario have benefited tremendously over the years from:

- **research breakthroughs—such as omega-3 eggs and DHA milk**
- **a safe food supply that protects Ontarians' health and the province's reputation in global markets**
- **new, hardier crops and the latest production techniques that improve farmers' bottom lines and consumers' food choices**

In 2008, the partnership was renewed and improved, continuing the tradition of innovation and accomplishment. A one-time injection of $56 million, as well as an ongoing financial commitment of approximately $300 million over five years will maintain the momentum of important ongoing work. The funding will also help explore new opportunities, such as:

- **car parts made from plant materials**
- **alternative fuels**
- **hardier crops**
- **new, nutritionally enhanced foods**
- **better protection from diseases**
- **faster responses to animal health emergencies**

The pages that follow show how Ontario will build on its position as a leader in agri-food innovation, thanks to this unique partnership.

Top: The Science Complex at the University of Guelph, which was completed summer 2007, centralizes the physical, biological and computational sciences on campus. It provides new laboratory and first-class research space for chemistry, biochemistry, molecular and cellular biology, zoology, botany and genetics.

Above: The headquarters of the Ontario Ministry of Agriculture, Food and Rural Affairs is located at 1 Stone Road in Guelph, adjacent to the University of Guelph campus. The Stone Road Complex anchors the cluster of industry and government offices, laboratories and research centres that make Guelph the agri-food centre of Ontario.

PHOTOS: TOP – PHILIP CASTLETON | BOTTOM – JIM WRIGHT

Guelph Agri-Food Cluster

The City of Guelph, Ontario, has become one of the largest agri-food clusters in Canada.

The partnership between the University of Guelph (U of G) and the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA), located at the Stone Road Complex adjacent to the campus, has been largely responsible for the growth of the cluster.

Since 2002, over $330 million* has been invested the area. As a result, there are now approximately 60 agricultural companies, 24 research facilities and more than 6,000 jobs in the agricultural biotech sector in Guelph. Multi-national companies such as Syngenta Crop Protection Canada Inc., Bayer Crop Science and Semex Alliance have established offices in Guelph because of the access to expertise, facilities and resources. The renewal of the OMAFRA-U of G Partnership in 2008 ensures the success of the cluster will continue.

*University of Guelph / OMAFRA Impact Study (Deloitte, 2007). View the full report at www.uoguelph.ca/research/omafra/omafra/reports/OMAFRA_UofG_Impact_Study_2007.pdf

PHOTO: MARTIN SCHWALBE

Animal Health Laboratory

The Animal Health Laboratory (AHL) unit of the Laboratory Services Division provides a full-service, fully accredited veterinary diagnostic laboratory that supports provincial animal disease diagnosis and surveillance. Scientists and technologists at the AHL link their expertise with University of Guelph personnel to provide a single source of laboratory service in animal health, encompassing food-producing animals (livestock and poultry), exotic and zoo animals, companion animals and avian and mammalian wildlife populations.

The Ontario Ministry of Agriculture, Food and Rural Affairs and the University of Guelph provide a critical mass of leading veterinary specialists and laboratory staff that contribute to achieving high quality and efficient testing.

Services Provided:

- Anatomic Pathology (Guelph and Kemptville)
- Avian Virology
- Bacteriology
- Central Services
- Clinical Pathology
- Histotechnology
- Immunology/Serology
- Mammalian Virology
- Molecular Biology
- Mycoplasmology
- Ontario Hatchery and Supply Flock Policy
- Parasitology
- Surveillance
- Toxicology
- AHL Client Services
- Specimen Reception

Procedures in support of disease surveillance:
2006/07—662,000
2007/08—691,000

Dealing with influenza

BY GRANT MAXIE

In the spring of 2009, when a novel influenza A, H1N1, first appeared in humans, the University of Guelph's Animal Health Laboratory (AHL) provided reference virus stocks to government health laboratories in Canada to help characterize the virus. The AHL is recognized internationally as a centre of expertise in animal influenza viruses, and is able to classify viruses and provide information on their epidemiology.

On a similar front, avian influenza is widespread internationally, but fortunately the worst form hasn't yet taken hold in Ontario. To better manage an outbreak, the AHL is working to develop quick detection methods. Avian influenza viruses such as the highly pathogenic H5N1 virus found in Asia can cause disease in humans, and poultry flocks found to have H5 and H7 viruses are eradicated.

When avian influenza is suspected in a poultry operation, action must be swift and thorough. The real potential exists for closed borders and huge economic losses to individual producers and the industry. For example, a 2004 outbreak in British Columbia resulted in the depopulation of 19 million birds and the loss of hundreds of millions of dollars to the industry.

The bulk of laboratory testing for avian influenza occurs after the outbreak. Birds in quarantine zones must be tested to confirm they are infection free, and that normal operation can resume at affected farms.

With the support of the Ontario Ministry of Agriculture, Food and Rural Affairs, the AHL was able to purchase automatic equipment to help in processing tests for avian influenza. A Beckman NX nucleic acid extraction robot and a high capacity thermocycler (Roche Lightcycler LC 480) allow technicians to handle up to 1,000 samples per day—a phenomenal jump from the previous maximum of 100 samples per day.

With the addition of extensive computer programming—and barcoding traceability for each field sample—results can be merged and transferred rapidly back to the Canadian Food Inspection Agency, with which the AHL works to provide seamless and efficient testing and reporting.

2-D barcoding of individual samples taken for avian influenza analysis results in quick and efficient traceability.

The new Pathobiology/Animal Health Laboratory being built on the corner of Gordon Street and McGilvray Street in Guelph will further safeguard animal and human health in Ontario.

PHOTOS: TOP – SARAH HOYLAND | BOTTOM – ROBBIE YOUNG + WRIGHT / IBI GROUP ARCHITECTS

Agriculture and Food Laboratory

The Agriculture and Food Laboratory (AFL) unit of Laboratory Services Division at the University of Guelph has been delivering accurate results for clients in agriculture, food and beverage, corporate and research sectors for over 30 years. With strong alliances in industry, government and academic sectors, this lab provides excellence in food quality and safety testing in Ontario and across Canada.

The AFL provides OMAFRA with high quality, special purpose laboratory services in support of the agriculture and food sectors and rural communities. In this partnership, the university offers a critical mass of leading faculty, research personnel and laboratory staff. OMAFRA and the AFL work collaboratively on the annual development of project descriptions and sampling plans that will fulfill the needs of the AFL's many clients.

Services Provided:

- Analytical Microscopy
- Dairy Analysis
- Drug Confirmation
- Drug Residues
- Food Chemistry
- Immunochemistry
- Microbiology
- Molecular Biology
- Plant Disease Diagnostics
- Soil and Nutrient Laboratory
- Toxicology
- Trace Organics & Pesticides

Tests in support of regulatory programs:
2006/07—929,000
2007/08—1,232,000

Over and out—almost—for plum pox

BY TODD MARROW

The plum pox virus (PPV) that threatened Niagara's tender fruit industry is well in hand, thanks to work by at the Agriculture and Food Laboratory (AFL), the collaborative efforts of the federal and provincial governments and the University of Guelph.

PPV is a serious plant disease affecting tender fruit (including peaches, plums, nectarines, and apricots) and ornamental trees and shrubs. The virus is transmitted from infected trees by aphids or by grafting or budding.

During the first few years, thousands of samples were found to be positive for the disease. In response, the federal government ordered many orchards within the province to be removed—in 2000 alone, 12,000 trees were destroyed.

However, on-going testing and eradication efforts have resulted in a significant decrease in the number of positive samples. They dropped to 131 last year, from 261 in 2007.

The laboratory's ability to scale up for the massive testing volumes associated with an eradication program of this nature is virtually unmatched… and one of the reasons for this capability is students. For this year's program, AFL hired 90 students to analyze 750,000 tree samples, all in a 16-week period.

Students Leandra Reid (l) and Ryan Hethrington (r) run the ELISA test used to detect plum pox virus. They are part of a group of 90 students working at the AFL this summer, in order to process 750,000 tree samples.

A major challenge in a project of this magnitude is to create processes that combine a student workforce with a high level of quality assurance around the results. Creative approaches to workflow design, training, and quality control have been put in place and resulted in the lab's ability to achieve the six sigma quality standard—or less than 3.4 errors per one million tests performed – four consecutive times over the past nine years.

"With more than four million samples now having been processed, the multiple six sigma ratings represent a truly monumental achievement," says laboratory director John Melichercik.

Rich Moccia, associate vice-president (research), agri-food and partnerships, ays the PPV eradication program uniquely combines the collective resources and support from the University of Guelph, Agricorp (a crown agency of the provincial government), and OMAFRA in delivering this high-value service to the federal Canadian Food Inspection Agency.

"Given the success of the sampling and testing program to date, this combined approach serves as a model for future plant disease eradication programs around the world," says Moccia.

For more than 30 years, the Agriculture and Food Laboratory has been delivering results for corporate and research clients in the agriculture, food and beverage sectors.

PHOTOS: TOP – MARTIN SCHWALBE | BOTTOM – ANDREW MOORE

Food for Health

Today's consumers are more interested in food and nutrition than ever before. OMAFRA and the University of Guelph's research into consumer trends, and food production and formulation has the potential to improve the health of Ontarians and provide competitive opportunities for producers and agri-food companies.

The partnership is also committed to supporting research to provide consumers with functional foods—foods that have been shown to have health benefits, such as reducing heart disease and the incidence of diabetes.

The scope of this research theme is large and complex, but the social and economic benefits can be enormous.

Consumers' purchasing decisions, dietary patterns and increased knowledge about the relationship between food and health will drive this research theme forward.

Making pork even healthier

For more consumer options, Prof. Kees de Lange and Héctor R. Martínez-Ramírez are working to develop omega-3 pork by feeding pigs enriched feed.

BY SARAH VAN ENGELEN

When it comes to buying health-promoting, omega-3-enriched foods in the grocery store, consumers can choose from fish, eggs and milk. Now, a researcher at the University of Guelph is working to add omega-3-enriched pork to that list.

Enriching meat with omega-3 has been a difficult task for the agriculture industry. The oily nature of omega-3 fatty acids has led to concerns about the appearance, shelf life and even the taste of pork from pigs fed flaxseed or fish oil. Prof. Kees de Lange, Department of Animal and Poultry Science, has been looking at alternative strategies to produce omega-3 pork.

One aspect of the research is to study conversions among omega-3 fatty acids in a pig's body, aimed at retaining docosahexaenoic acid (DHA) in pork products. Among omega-3 fatty acids, DHA is the most potent for providing health benefits to the consumer.

These researchers have already shown that pigs retain about 70 per cent of ingested omega-3 fatty acids from flax seed oil. Also, the DHA content in a pig's body doubled in about two weeks.

Surprisingly, the researchers saw a 30-fold increase in eicosatrienoic acid (ETE), considered to be the precursor for DHA synthesis. ETE retention seems unique in pigs. If ETE provides the same health benefits to the consumer as DHA, pork could indeed be another good source of health-providing omega-3 fatty acids.

Collaborators in this research include Ph.D. student Héctor R. Martínez-Ramírez, Prof. Bruce Holub and Dr. John Kramer. Additional support is provided by Ontario Pork and the Natural Sciences and Engineering Research Council.

ALL PHOTOS: MARTIN SCHWALBE

Super spearmint

BY KATIE SAVAGE
AND KIM WAALDERBOS

Tea time will soon have added health benefits for consumers. Plant agriculture professor Laima Kott has boosted spearmint plants used for tea with increased amounts of rosmarinic acid, a strong antioxidant and anti-inflammatory.

Kott has developed spearmint plants with 20 times more rosmarinic acid and says the increased levels will relieve symptoms of asthma, arthritis and other inflammatory diseases.

"Drinking two cups of spearmint tea with increased rosmarinic acid levels a day will show improvement in the health of people suffering inflammatory-type diseases," she says.

In her work, Kott selected seeds *in vitro* that produce plants with elevated amounts of rosmarinic acid. Once these individual plants were identified, the best were chosen for further breeding.

She says spearmint is an ideal plant for this research because mint grows rapidly and already has some natural amounts of rosmarinic acid. This ingredient is difficult and expensive to produce synthetically, but by increasing the levels in spearmint, the plants produce acid that can be harvested for further use.

McMaster University Medical Centre researchers are conducting clinical trials with this tea for Kott to determine if it helps asthma suffers.

Additional support is provided by Agriculture and Agri-Food Canada and the Natural Sciences and Engineering Research Council.

Prof. Laima Kott of the University of Guelph is making tea even better by increasing anti-inflammatory properties in spearmint plants.

Functional food advances with Proof-of-Principle Fund award

The first grant from the new OMAFRA-sponsored Proof-of-Principle Fund has been awarded to an *in vitro* study with spearmint tea, to determine the anti-inflammatory potential of the ingredient rosmarinic acid.

Researchers Laima Kott and Wendy Pearson, Department of Plant Agriculture at the University of Guelph, will receive funding to help bridge the gap between their existing research and commercial development of the product. The University of Guelph's Business Development Office, which granted the award, says this study could increase the marketability of the mint as a functional food for human and veterinary applications.

This funding from the OMAFRA - U of G Partnership will be used for applied, proof-of-principle activities not normally supported by granting agencies or other funds. Projects likely to benefit from these funds are identified by the Business Development Office through its disclosure and intellectual property review process.

Five years strong for Dairy Oh! milk

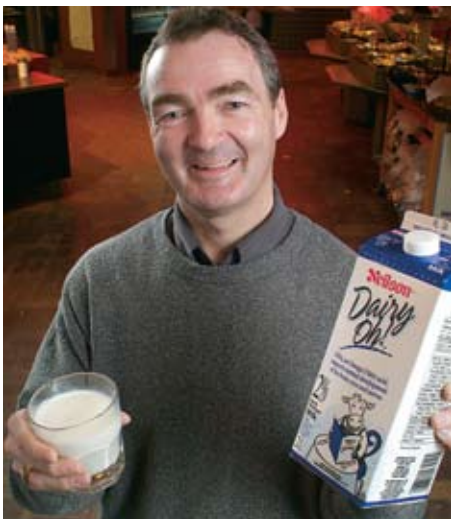
Cows' milk, already a superb source of so many nutrients, received a huge boost when Guelph researchers discovered how to enrich milk with docosahexaenoic acid (DHA), an essential nutrient missing in many people's diets.

Prof. Brian McBride and graduate student Tom Wright, Department of Animal and Poultry Science, developed a special feed supplement for dairy herds. Then they teamed up with Prof. Bruce Holub, Human Health and Nutritional Sciences, to determine its effects on milk fat.

The milk these herds produce after eating the supplement is DHA-enriched. And the final result of their research was Neilson's Dairy Oh!, which celebrates its fifth anniversary this year.

One serving of Dairy Oh! milk provides about one-third to one-fifth of daily DHA requirements.

Additional support was provided by the Natural Sciences and Engineering Research Council.



Dairy Oh! milk, a functional food enriched with DHA, was developed by a research team at the University of Guelph led by Prof. Brian McBride.

Fruit that fights disease

Research has led to a healthy combination of local fruit with antioxidant benefits

BY KAITLYN LITTLE

Juicy peaches, sweet cherries and fresh plums are all stone fruits that have become familiar tastes during Ontario summers. They also happen to be packed with powerful antioxidants. And many of these fruits would be imported, without the work of University of Guelph researchers. Through various techniques—genetics, selective breeding and biotechnology—researchers have been developing healthier fruit varieties that will flourish in the Canadian climate and markets.

Tree fruit expert Prof. Jayasankar Subramanian is one of the researchers involved. He's focused his efforts on breeding stone fruits that mature earlier and have increased antioxidant properties in order to tap into growing consumer demand for local foods with health benefits.

"Being able to grow these fruits locally is important to take advantage of the health promoting compounds that are more readily available in the fresh product," says Subramanian.

Antioxidants have been touted for their ability to reduce diseases such as some cancers, Alzheimer's and heart disease. As awareness of antioxidants grows, consumers are looking more to foods to obtain their benefits.

Specifically, Subramanian is leading a research team that has been breeding cherries that can be harvested earlier in the year to help meet local market demands and compete with imported US varieties. The researchers are beginning to see a connection between disease resistance and higher antioxidant levels in cherries.

This connection is also being explored in other stone fruits. Some new varieties under development show high levels of disease resistance and also contain two to six times more antioxidants than the standard varieties, Subramanian says.

Additional support is provided by the Ontario Tender Fruit Producers' Marketing Board.

Peaches, cherries and plums are full of antioxidants and are the focus of Prof. Jayasankar Subramanian's research.

Omega-3 chicken about to hatch

Poultry meat enriched with flax and fish oil diets offers extra health benefits

BY ARTHUR CHURCHYARD

The egg may have come first for omega-3-enriched poultry products, but now the chicken isn't far behind.

Prof. Steven Leeson, Department of Animal and Poultry Science, has already enriched eggs with omega-3 fatty acids. Now, he's leading an effort to do the same with poultry meat. He's identifying various poultry feed combinations that can be fed to chickens to add heart-healthy fatty acids to the animals' meat — while also keeping it tasty.

"We've shown it's possible to feed poultry omega-3 fatty acids and have the nutrients expressed in the meat," says Leeson. "Now our challenge is to help farmers produce this enriched meat efficiently, while maintaining quality and taste."

He's found the poultry became sufficiently enriched with omega-3 fatty acids after 10- to 14 days on a flax-seed diet. At this stage, the nutrients build up in the body fat and, once present, are constantly reused in cycles for growth and energy.

One of the omega-3 fatty acids stored in the fat layer is docosahexaenoic acid (DHA). Leeson calls DHA the "super fat" because of its many health benefits.

First it was the egg, now chickens are being introduced to beneficial omega-3 fatty acids.

DHA is known to improve human visual and learning abilities, boost immune function and relieve symptoms of some psychological disorders and inflammatory diseases.

Leeson predicts a market for nutrient-enhanced poultry meat in sales of whole chickens, the kind used for roasting. Unlike most meat cuts that are too lean to store enough fatty acids, whole chickens contain much of the original fat content, which is where DHA and other omega-3 fatty acids are stored.

PHOTOS: TOP – MARTIN SCHWALBE | BOTTOM – OFAC ANIMAL AGRICULTURE PHOTO LIBRARY

Production Systems

This research theme seeks to enhance the profitability of agricultural production. It encompasses other areas of the OMAFRA-University of Guelph Partnership research program that may play a significant role in productivity or profitability, including environmental sustainability, consumer demand, bioproduct opportunities, and agricultural and rural policy.

Government support of production systems research is critical for a number of reasons. Animal and plant health and the impact of agriculture on the environment are closely tied to important priorities like safe food and clean water. Legislative requirements, minimal private sector research, and the enormous significance of agricultural production to the Ontario economy all point to the importance of this research theme.

An edge for Ontario apple growers

Production innovations help make local industry more competitive

BY ROBERT FIELDHOUSE

Innovative apple production strategies being developed at the University of Guelph are strengthening both the Ontario apple industry and the orchards of individual growers.

Prof. John Cline, Department of Plant Agriculture, aims to boost the province's $80-million apple industry, which faces increasingly intense international competition.

Cline has developed several strategies to improve production, enhance fruit quality and decrease costs of production by providing growers with greater control in manipulating the natural physiology of the tree (fruiting, flowering and tree growth).

"Research and innovation are going to help the industry survive and compete," he says. "Our overall goal is to help Ontario apple growers produce high-quality fruit in an economically sustainable way to help them compete globally."

Cline's research takes place on five- to 10 hectares of land at the university's Simcoe Research Station. The research areas he is exploring include new growth-controlling compounds called bioregulators, and optimized rootstock and cultivar combinations.

Bioregulators can have profound effects on apple tree physiology and are an effective, inexpensive and safe way for growers to influence production, he says. They're made to mimic natural compounds found in apple trees to influence traits such as growth, flowering, ripening, yield and apple quality.

"Plant bioregulator work is continually changing, offering new apple production opportunities for growers," says Cline. "They're very specific compounds that play a specific role in the plant."

He has recently studied the effects of a new bioregulator called prohexadione calcium (Apogee). It reduces vegetative growth by inhibiting the synthesis of gibberellic acid, a naturally occurring plant hormone that, among many roles, stimulates vegetative growth. Cline says growers can use Apogee to improve fruit quality, reduce shoot growth (and ultimately pruning) and, in some instances, reduce injury caused by fire blight, a devastating bacterial disease.

Additional support is provided by the Ontario Apple Growers.

Prof. John Cline is using innovative production technologies to grow Ontario apples and give them a competitive edge in global markets.

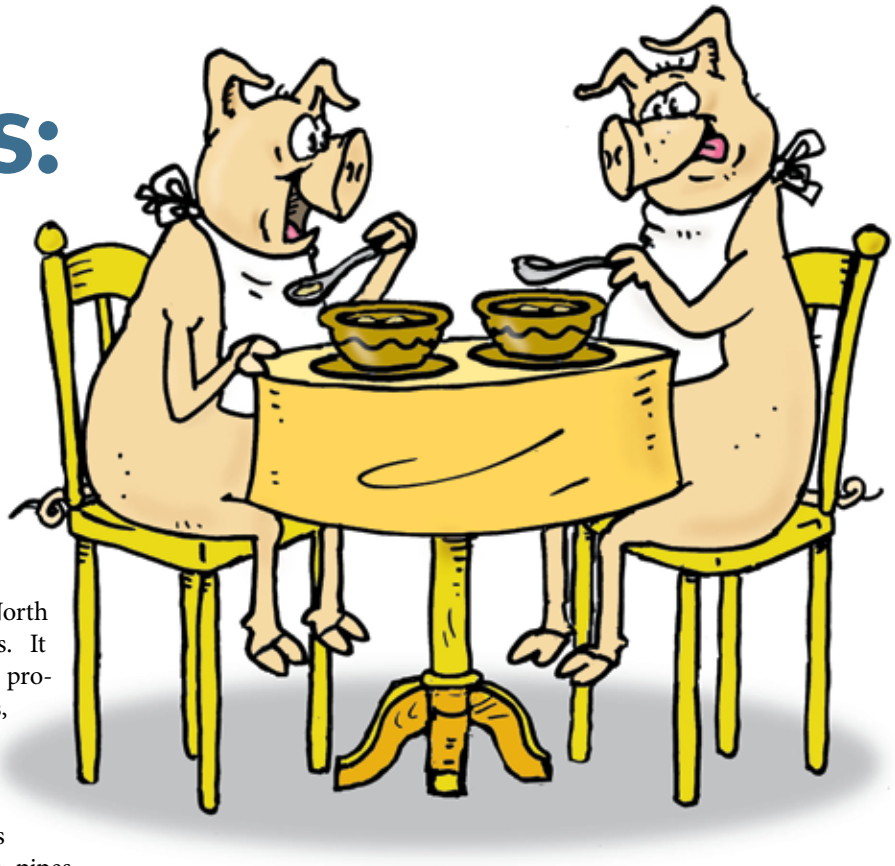
PHOTO: MARTIN SCHWALBE

Soup for pigs:

THE LINE BEGINS TO FORM

Researchers say liquid feed systems are good alternatives for farmers

BY KATIE SAVAGE



Liquid feeding systems for swine farms reduce feeding costs and increase the gut health of pigs.

Liquid feeding systems are being adopted by swine operations throughout North America and already have a foothold with 20 per cent of market pigs raised in Ontario. Are they really better? Is this "soup for pigs" superior to traditional dry feed?

University of Guelph researchers are assessing how liquid feeding is suited to Ontario farm conditions. Prof. Kees de Lange, Department of Animal and Poultry Science, is halfway through a six-year research program to explore the potential benefits of feeding pigs liquid diets. He says liquid feeding may be more versatile, economical and healthier than conventional dry feeding systems.

"Liquid feeding systems are being increasingly adopted on Ontario swine farms," says de Lange. "They could help lower feed costs for pig producers and use co-products from the food and biofuels industries that would otherwise go to waste and become environmental hazards."

Liquid feeding started in Europe and is widely used in Germany, Denmark, the Netherlands and the United Kingdom. But it's only now catching the interest of North American producers. It uses a computerized program to mix liquids, such as whey and water, with dry feed components. The liquid feed is then distributed via pipes that pour the mix into feed troughs for the pigs.

In his study, de Lange is finding that feeding a liquid diet reduces feed costs because farmers can use a wider range of ingredients than can be used in conventional dry feeding programs. Wet co-products from ethanol and starch production, such as corn distillers solubles and corn steep water, can fit well in liquid feed formulations.

De Lange says liquid diets also help generate a healthier gut environment in pigs and reduce the prevalence of salmonella. He's studying how enzymes and microbes can be added to partially ferment the liquid feed and further enhance its nutritive value. He says microbes that can degrade toxins would be particularly helpful during years when mycotoxins (damaging fungal toxins) in corn crops are elevated.

Additional support is provided by Ontario Pork, the Natural Sciences and Engineering Research Council and numerous industrial partners, which are listed on the website of the Swine Liquid Feeders Association (www.slfa.ca).

Organic dairy centre now official

The Campus d'Alfred dairy farm obtained organic certification in February 2008 and became the Organic Dairy Research Centre, after a three-year transition process.

The centre is part of the University of Guelph's network of Ontario Agricultural College campuses and research stations. It offers diploma and certificate programs, all taught in French.

The centre includes the newly certified organic dairy herd, the fields and associated research facilities. It will operate on a cost-recovery basis funded by milk sales. It also serves as a medium for information and technology generated by research at other institutions in North America and Europe, and operates in both English and French. Research conducted at the facility, coupled with outreach efforts, will transfer knowledge and technology to the dairy industry for both organic and conventional farms.

ILLUSTRATION: BRIAN FRAY

Towards better breathing

Protein discovery could help fight asthma

BY ARPANA CHAKRAVARTY

The fungal spores and hay particles that accompany a deep breath in the barn can cause inflammation in a horse's lungs and eventually lead to airway obstruction, or asthma. Now, a University of Guelph researcher is looking at new ways to treat asthma so horses can breathe easy.

Prof. Dorothee Bienzle, Department of Pathobiology, has found a protein called Clara cell secretory protein (CCSP), which is naturally produced in the lower bronchi. It reduces inflammation in the lungs and may be able to treat longstanding asthma.

She says CCSP is depleted in horses that have had asthma for a long time, and their bodies have lost the ability to produce it by natural means. Although the mechanism by which this occurs is still unknown, Bienzle believes the CCSP depletion is directly linked to asthma development.

Once Bienzle finds out how much of the protein is left in horses that have asthma, she'll look for ways to replenish CCSP levels with a synthetic form of the protein.

Additional support was provided by Equine Guelph and the Canada Research Chairs Program.

A smoother way to go organic

New computer program can help farms identify problems early when converting to organic production

BY SARAH VAN ENGELEN

Dairy farmers now have a program that will help them determine issues they will face if they want to transition into organics.

Converting a conventional dairy farm into a certified organic-milk-producing farm takes several years before the milk is market ready. During a farm's conversion, cattle are restricted to organic feed, their pastures are strictly regulated and they are cared for without antibiotics or hormones. Now, researchers at the University of Guelph's Kemptville Campus have created a risk management program to help milk producers determine if their farm can manage the transition to organic production.

Prof. Jim Fisher, Richard Broadwith of BCI Consulting and staff at Organic Meadows Inc. have collaborated to create the Business Risk Workbook. It's an Excel computer program in which producers input their production information and respond to questions that evaluate 11 management scores.

In the end, the program will help create budget projections for the first organic years, based on producers' organic production knowledge and their management practices. The resulting projections pinpoint what producers must do to successfully transition to organic milk production.

Here's how the process works. Producers establish their organic knowledge and management practices, then go through the workbook to estimate production costs for the dairy and associated feed crops, with emphasis on the transition year—in the case of livestock, this is the final year of a three-year process. Output analysis includes management scores, transition risks and budgets from the first transition year, through to the first organic year. The resulting numbers guide farmers in their transition to becoming certified organic milk producers, and give them a basis for their decision-making process.

Beginning this spring, the organic transition course will be offered through Kemptville Campus' eSchool on-line platform. Fisher will work with student clients interested in organic dairy production on a one-to-one basis, providing instruction via the Internet on how to use and interpret the workbook.

Additional support is provided by the Agricultural Management Institute.

PHOTOS: TOP – GINA HANF, ISTOCKPHOTO | BOTTOM – OFAC ANIMAL AGRICULTURE PHOTO LIBRARY

The Ontario Ministry of Agriculture, Food and Rural Affairs & the University of Guelph

Partners

Great new ideas

in Ontario's agri-food industry are sparked by the unique partnership between the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) and the University of Guelph (U of G).

Through the partnership, the university delivers the agri-food research, laboratory services and veterinary clinical training to address Ontario's economic, social and environmental priorities.

It's no surprise that this investment in knowledge and innovation pays big dividends. An independent study* showed that the U of G was able to attract almost two dollars for every dollar of provincial funding. Spin-off benefits from the province's annual 54.8 million investment resulted in a total economic impact of more than $1 billion.

University researchers work collaboratively with their colleagues around the world to advance the province's agri-food industry for the benefit all of Ontarians.

From state-of-the-art laboratory and clinical facilities to pilot plants and research stations, U of G's specialized expertise and unique facilities help to make Ontario safer, cleaner and more prosperous.

*University of Guelph – OMAFRA Impact Study (Deloitte, 2007)

Amanda House (left) and Chris Delaney, developers of YoPRO, a new performance frozen yogurt, tapped into University of Guelph's expertise in food product development and marketing to launch their new product.

Prof. Jennifer DeEll, OMAFRA Fresh Market Quality Program Lead, focuses on improving the post-harvest quality of fresh fruits and vegetables. This benefits consumers by extending the availability of Ontario-grown produce, and helps the Ontario industry to be more competitive at home and abroad.

Strengthening Ontario's economy

Ontario's agri-food industry is the province's second-largest manufacturing sector. Products such as omega-3 eggs, developed from research funded by the OMAFRA-U of G Partnership, support the economy by creating new markets. And novel technologies that replace imported foods with home-grown products keep jobs in Ontario.

The partnership strengthens Ontario's economy in many more ways—from sophisticated laboratory testing programs to advanced clinical veterinary training. Like research for clean air and water, it's hard to put a price tag on the value of these services. But without question, the quality and safety of Ontario agri-food products are essential to the health of Ontario's economy.

Student Jenny Kungl, shown studying ruminant health at the Ontario Veterinary College (OVC), is now a large animal veterinarian in Tillsonburg, Ontario. The OMAFRA-U of G Partnership provides clinical training for OVC's students and support to the college's internationally accredited teaching hospital.

Education

Across the province, teaching and research facilities at the three U of G regional campuses provide agri-food diploma and continuing education for the most up-to-date training of industry workers. At the main campus, a new HQP (Highly Qualified Personnel) program will provide graduate students with enhanced work place skills to complement their academic training.

PHOTOS: TOP & MIDDLE – KERRY LITTLE | BOTTOM – PAULA MENZIES

for Progress

Better health

The opportunities are growing for Ontario's agri-food industry to contribute positively to the health of Ontarians, as the links between diet and health become increasingly clear.

New food technology, such as the development of DHA milk, benefits human health and provides economic opportunities and competitive advantages for Ontario agri-food companies and producers.

Better health for Ontarians is a key part of the partnership mandate - from environmental research to animal disease surveillance and food safety. U of G scientists aim to better understand the complex interaction of factors involved in the health of agri-food and rural ecosystems and their residents.

Prof. Ming Fan and his associates and students have been investigating soluble fibre and other bioactive compounds, such as peptides from eggs, for their effectiveness in reducing human bowel inflammation, oxidative stress and hypercholesterolemia. They've been using pigs fed a typical Western diet as a recognized large animal model for human nutritional studies.

Mike Cowbrough, Weed Management Lead for OMAFRA, worked with University of Guelph researchers to develop a computer program for farmers that balances herbicide use with optimum crop yield, maximum profit, and environmental protection. The program is based on 20 years of weed science research at the U of G.

Protecting the shared environment

Research into environmental sustainability under the partnership is aimed at strengthening our natural resources—soil, water, air and biodiversity—to support agriculture and food production and rural communities.

This research has already produced tangible results. The Environmental Farm Plan and Best Management Practices adopted by thousands of farmers across the province, plus Ontario's Nutrient Management Act, are just a few examples of science-based initiatives that are making Ontario agriculture a partner in environmental protection.

Support for communities

Rural Ontario communities are a significant contributor to the province's economy, and home to more than four million people. Strong rural communities are key to a strong, healthy province.

Rural economies can be invigorated through innovation and diversification, and research helps make that happen. At the University of Guelph, agricultural and rural policy research explores the opportunities and challenges of rural Ontario—like the impact of climate change, rural infrastructure and labour market needs. That's valuable information to help shape public policy and direct government action where it can be most effective in supporting agriculture and rural communities.

PHOTOS: TOP LEFT – KERRY LITTLE | TOP RIGHT – MARTIN SCHWALBE | BOTTOM RIGHT – TRACY LAMB

This research theme focuses on strengthening agri-food value chains in Ontario through research to provide innovation in product development and enhancement. Businesses operating along a value chain can combine their resources and capabilities to achieve commercial success that might not otherwise have been possible if they acted in isolation.

Agri-food value chains are not limited to primary production and processing. The OMAFRA-University of Guelph Partnership supports research into other important components including market analysis, consumer behaviour, commercialization and quality assurance.

By improving any or all aspects of product development, overall productivity, profitability and sustainability can be improved.

Tailored ingenuity for creative feed delivery

BY SARAH VAN ENGELEN

With a little creativity and a lot of cooperation, old and new technologies have become partners at the Elora Beef Research Centre.

The centre, one of several research stations supported by the University of Guelph and OMAFRA, had to be resourceful when it came to purchasing new feed trucks for the facility.

Most barns and buildings at the centre were built 30 years ago when equipment was smaller. This older design made it hard to purchase newer, larger capacity feed trucks, which are able to feed more cows with one load.

The specially designed feed trucks at the Elora Beef Research Centre are able to move through smaller spaces and deliver more accurate feed rations.

This physical space limitation meant feed trucks had to be custom-made to maneuver between feeding mangers. In addition to a compact shape, the trucks also needed two-speed gear boxes for slower and more accurate delivery of research rations to individual animals.

Elmira Agri-Systems rose to the occasion. Technicians there helped the research centre design specifications for two unique—and unusual looking—feed trucks.

These vehicles are the centre's newest upgrade. In 2005, a new 22,464-square-foot feedlot barn was built, containing computerized feed-measuring equipment (valued at more than $2 million) for monitoring nearly 200 cattle. The facility also contains a special animal handling unit for ultrasound, blood tests and body composition measurements.

Animals housed in this barn wear ear tags that transmit information to a central electronic data system. This allows researchers to keep track of the animals' feed preferences, intake and even their social habits—such as which cows like to eat beside each other, and which ones they avoid. R

PHOTOS: REMO PALLOTTINI

A facelift for filters

Researchers to put enzyme components on paper surfaces

BY ROBERT FIELDHOUSE

New protein-enhanced paper filters that are being developed to capture harmful particles have the potential to keep us healthier and safer, says a University of Guelph researcher.

Prof. Chris Hall, Department of Environmental Biology, says the specialized filters he and his collaborators are creating could be used to actively remove water contaminants, purify disease-causing antigens for medical research, prevent undesirable agents from entering emergency blood supplies, protect citizens from bioterrorists, and filter air in cars.

"The real difficulty is getting whatever it is that binds to pathogens to bind to paper too," says Hall.

Current filters rely mostly on small pores that block contaminants from passing through based on their size, says Hall. But now the goal is to create advanced filters that will actively remove unwanted components in a variety of situations.

Most filters are based on cellulose, a carbohydrate that's the main component in paper. The new filters will feature special proteins that stick to cellulose. The proteins will have two parts: one called a cellulose binding domain (CBD) to bind to cellulose, and the other an antibody to bind pathogens and other contaminants.

Hall says the protein's CBD will be borrowed from enzymes that normally bind to cellulose and degrade it. Then, using molecular biology tools, Hall and his team will create "fusion proteins" that replace the degrading component with an antibody that recognizes and fuses to harmful agents, anchoring them to the filter surface and preventing them from passing through the paper's pores.

This type of filtering goes beyond just using size to exclude undesirable materials. For example, a SARS-fighting antibody could be linked to paper through a CBD. This paper could then be used to supply healthcare workers with SARS masks that prevent them from inhaling the virus by trapping it first, says Hall.

Prof. Chris Hall (right) and his research associate Yongqing Niu are borrowing enzymes that normally bind to plant cellulose to develop special paper which can filter harmful particles.

"It's absolutely amazing," says Hall. "Paper can be used to do just about anything. What we really want to do is build a platform for rapidly detecting pathogens by optimizing its use."

Additional support is provided by the Natural Sciences and Engineering Research Council, the SENTINEL Network and its industry partners.

If you can't beat it, adsorb it

Special fibres for broiler breeders can prevent intestinal damage from mouldy feed

BY ARTHUR CHURCHYARD

Fusarium mould has been growing rampantly in the heat of recent summers, widely infecting grain crops. As the mould becomes more prevalent, it inevitably produces more mycotoxins (poisons), resulting in higher toxin levels in the grains being fed to chickens. That causes intestinal damage and reproductive problems in the birds.

Now, researchers at the University of Guelph say a natural fibre found in yeast can be used to remove mycotoxins consumed by broiler chickens, preventing health problems.

Prof. Trevor Smith and graduate student Mojtaba Yegani of the Department of Animal and Poultry Science have spent the last two years studying the effects of this fibre, called polymeric glucomannan mycotoxin adsorbent (GMA), which can be included in broiler diets in tiny amounts.

"It's often difficult to find Fusarium-free grain," says Smith. "So if mycotoxins have to be in broiler diets, it's crucial to also include something in the feed that can prevent damage from mycotoxins by adsorbing them."

GMA is found in the inner cell wall of yeasts and is obtained after culturing, fractionating and drying yeast cells. It doesn't affect the nutritional value of feed because only two kilograms are needed per tonne of grain to be effective against Fusarium.

Prof. Trevor Smith is adding a natural fibre found in yeast to chicken diets to help prevent intestinal and reproductive problems.

GMA is a large indigestible molecule that passes harmlessly through chicken intestines. The molecule has branches with electrically charged ends that can attract particles of the opposite electrical charge. In a chicken's digestive juices, mycotoxins become charged and stick to GMA like magnets. The chicken can then excrete the mycotoxins in feces.

Smith says feed additives derived from yeast are gaining popularity as an alternative to growth promoting antibiotics, which are banned in the European Union and under scrutiny in Canada. He says GMA is also an economically viable alternative for poultry farmers who want to prevent mycotoxin damage because such a small amount is needed in the diet to improve broiler health.

Additional support is provided by Alltech Inc.

PHOTOS: TOP – OFFICE OF RESEARCH, UNIVERSITY OF GUELPH | BOTTOM – MARTIN SCHWALBE

The meat of the matter

Animal scientists find genetic link behind beef tenderness

BY ARTHUR CHURCHYARD

Graduate student Gina Schick and Prof. Stephen Miller are developing a test that will predict tenderness in meat.

Beef tenderness can have a big impact on consumer satisfaction. In fact, it's consistently rated as the most important factor in store-bought beef purchases. Predicting tenderness isn't easy, but University of Guelph researchers are discovering genetic links that will help make it possible.

Using specialized analytical equipment and a decade of data from the Elora Beef Research Centre, a team led by Prof. Stephen Miller of the Department of Animal and Poultry Science, is working to pinpoint the part of a beef animal's genetic makeup that influences meat tenderness. Miller says these findings are leading to new testing methods to better determine tenderness and improve the final product consumers buy on store shelves.

"The end result of our work will be a test producers can use to help guarantee that beef is more tender," he says. "Using that test, we can focus our cattle genetics to develop clear advantages in meat quality."

The snippets of genetic information the researchers are working with are single nucleotide polymorphisms (SNPs). SNPs are tiny differences among genes that produce differences in animal characteristics, such as meat-quality traits like tenderness.

The researchers have identified an SNP linked to the protein calpastatin, which works against natural tenderizing agents to keep meat tough. The result is an easy-to-administer genetic test that has been commercialized and is available to beef breeders. The presence of this SNP is determined using a simple tissue sample, such as a hair follicle or ear punch. Current research is testing 50,000 SNPs scattered across the genome in an attempt to capitalize on all of the genes that could be contributing to tenderness.

Miller and his colleagues are using these findings along with advanced breeding strategies to help the industry build stronger herds for meat tenderness. Figuring out which SNPs are related to more tender meat will be the key to breeding better beef, he says.

Additional support is provided by the Ontario Cattlemen's Association, the Beef Cattle Research Council, the Agricultural Adaptation Council's CanAdapt program, the Canada Foundation for Innovation, Ontario Innovation Trust and Agriculture and Agri-Food Canada.

New advances for Ontario's biggest crop

Collaborative efforts in research have helped make soybeans a top commodity

BY SARAH VAN ENGELEN

Greatness can be developed over time. Take Ontario soybeans, for example. Backed by a commitment to research, they've gone from limited varieties and uses, to one of Ontario's largest field crops. Today, soybeans dominate the agricultural industry and economy.

In 1981, there were 700,000 acres of soybeans harvested in Ontario. But by 2006, just 25 years later, that number had mushroomed to 2,130,000 acres—an astounding 300 per cent increase.

Ontario's soybean industry saw this incredible growth in part due to the partnership between the Ontario Ministry of Agriculture, Food and Rural Affairs and the University of Guelph. Fundamental and applied research at the Guelph, Ridgetown and Kemptville campuses, and collaboration and complementary efforts among researchers in Ridgetown and Guelph have significantly contributed to soybeans' expansion in Ontario.

In the late 1970s, Prof. Tom Michaels, technician Tom Smith and Prof. Peter Pauls of U of G's Department of Plant Agriculture, coordinated the development of OAC Rex, a white bean variety with natural resistance to bacterial blight. After years of refining, the bean became available to producers in 2004.

Now, researchers are working on the next generation—a grandchild of OAC Rex, so to speak—that is predicted to increase yield by 20 per cent.

Additional support is provided by the Natural Sciences and Engineering Research Council, Alberta Pulse Producers, Manitoba Pulse Producers, Saskatchewan Pulse Producers, Ontario White Bean Producers and the Ontario Coloured Bean Growers.

Prof. Peter Pauls helped develop OAC Rex, a white bean variety resistant to bacterial blight.

PHOTOS: TOP – MARTIN SCHWALBE | BOTTOM: DAVE PELESCHAK

Plant and animal products in agriculture have long been used primarily for food and feed. The terms bioeconomy and industrial uses refer to the incorporation of renewable biomass resources—in whole or in part—into non-food and non-feed manufactured products, or energy systems. Often biomass is used to replace petrochemicals, with the benefit of making production more environmentally sustainable.

This research theme focuses on three major product categories—biomaterials (e.g., textiles, carpets and panels), biochemicals (e.g., lubricants, sealants and oil) and bioenergy (e.g., ethanol, methanol and biodiesel)—all of which involve the use of agriculturally derived biomass to reduce dependency on petroleum-based materials.

A greener way to go

Researchers are developing plastic composites that include agricultural materials

BY LINDSAY BROWN

Fibres from agricultural crops are being integrated into car parts by Prof. Larry Erickson and University of Waterloo Prof. Leonardo Simon.

Every car on the road contains more than 200 kilograms of plastic. This plastic is typically made with raw materials and energy from petroleum or natural gas, and it's not biodegradable, which has enormous environmental implications. Now, a new initiative involving four top universities could see car parts become biobased, by integrating plant materials into plastic.

Prof. Larry Erickson, a plant geneticist, says this "biocar" initiative is the first time Ontario's top two sectors—automotive and agriculture have worked together on a grand scale. He says the pairing could usher in a new era of building materials that will lessen dependence on petroleum-based plastics.

"No car in Ontario is yet made from plastic composites that include plant material," says Erickson, "but there's great potential to use local crops in Ontario-made cars."

Along with many plant breeders, processing and chemical engineers, and design analysts, Erickson is studying how to produce car parts made from plant-based plastic composites. Currently, researchers have successfully used plastic composites to make residential siding and lumber for fences, decks and bridges.

The biocar initiative is a joint research program involving the University of Guelph, the University of Toronto, the University of Waterloo and the University of Windsor. The starting steps for this research are taking place at Guelph—the agri-partner in the group.

Erickson says the initiative will be a huge opportunity for the Ontario agricultural industry to gain profile and make a bigger mark on the economy. Local farmers will have more outlets for their commodities, enhancing crop value.

"This bioproduct research will ensure a stable supply of renewable, more reliable plastics made from local crop sources that will be very valuable compared to the use of plastics from petroleum, which must be imported and can make the economy vulnerable during shortages," says Erickson.

Additional support is provided by Agriculture and Agri-Food Canada, the Natural Sciences and Engineering Research Council and the Ontario Ministry of Research and Innovation.

PHOTO: MARTIN SCHWALBE

Oil from the soil

Building biodiesel opportunities for Ontario farmers and processors

BY KYLE MAW

Biodiesel is processed fuel made from biological sources, most often readily available vegetable and animal fats. By keeping pace with technological advances, Ontario biodiesel production is beginning to flourish. Now, University of Guelph researchers are working to position soybeans as an attractive and economical source of biodiesel. They're trying to modify soybeans to produce oil that blends better than current biodiesel sources.

Profs. Gary Ablett and Istvan Rajcan and graduate student Golsa Saket of the Department of Plant Agriculture say using soybeans as a biodiesel source could provide economic advantages for both farmers and fuel processors, provided the soybean varieties selected for this application are bred to have a favourable combination of oil quality and quantity.

"We're looking to create higher value for farmers and companies producing biodiesel by making soybeans more attractive as a raw commodity," says Ablett.

In the past, soybean varieties were developed for protein content rather than the high oil content needed for biodiesel. These varieties have many uses because of their health benefits. Pushing for higher oil content means a trade-off for lower protein.

Profs. Gary Ablett and Istvan Rajcan are part of a team trying to modify soybeans to produce oil that blends better than current biodiesel sources.

Typical soybean varieties have an oil content of 18 to 20 per cent. The researchers hope to increase oil content to 23 to 25 per cent. This is considered a significant increase and is as high as they will aim. Otherwise, yield potential would be sacrificed.

To increase soybean oil content, the research team is breeding and then screening large numbers of soybeans to select only those that have high oil content, compared with their parental lines. Those varieties are then used for further breeding and are tested for other agronomic traits such as plant height and time to maturity.

This study began in 2005, and Ablett says it will take several years before some of the varieties they're developing will be available to farmers, which is why long-term research approaches such as this are so important for new-variety development.

Additional support is provided by the Canada-Ontario Research and Development Program and the Ontario Soybean Growers.

Rye mat roll means weed control

BY PAULO LaBERGE

Efforts to keep weeds out of organic crops can cost growers thousands of dollars and a great deal of time. To make it easier, a researcher at the University of Guelph's Ridgetown Campus is trying to find a cover crop that will protect organic crops and improve yields.

Prof. Darren Robinson, Department of Plant Agriculture, has been using fall rye to create a mulch and mat layer that could substantially reduce the growth of weeds in organic vegetable crop fields.

His field trials began last May and will continue over the next three years. If Robinson's cover crop proves to effectively control weeds, farmers could benefit from cost savings in the long-run.

"Weeds reduce yields and crop quality, which leads to a reduction in net returns," says Robinson. "We might be able to help stop that from happening."

Indeed, a weed removal treatment and hoeing an organic crop field can cost up to $200 per acre, and must be repeated up to four times throughout growing season. That's one reason why organic vegetables can be expensive.

Discovery and development in bioproducts

BY SARAH VAN ENGELEN

Turning soy, wheat, corn and other crops into everything from car parts to fuel is a way to keep Ontario clean and green. And that's the goal of the Bioproducts Discovery and Development Centre and the researchers who conduct studies there.

The centre, officially opened October 2008 at the University of Guelph, supports the research of Prof. Manjusri Misra and the centre's director Prof. Amar Mohanty. The researchers have joint appointments in the Department of Plant Agriculture and the School of Engineering.

Misra's interests lie in biobased materials and what she terms "green" nanotechnology. She researches the engineering of a range of bioproducts including polymers and nanoparticles, looking at the uniformity of material, and how to keep it strong, yet lightweight.

Mohanty holds the Premier's Research Chair in Biomaterials and Transportation. He is looking at manufacturing processes including extrusion, injection molding, and thermoforming using crop-based polyesters, polyurethanes, natural fibres and other materials to substitute those currently produced from petrochemicals. His research looks into engineering renewable resource-based "green" biomaterials for sustainable manufacturing in auto parts and consumer products.

"True green composites from plant derived biofibre and crop-derived bioplastics is the way of the future," says Mohanty. One of his interests is biodegradable polymers and sustainable packaging such as biobased waste that can be diverted from landfill and recycled into a valuable new products.

To that end, Mohanty is working on new uses for glycerol and soy meal remaining from biodiesel production. He also finds value-added uses for lignin, the byproduct of cellulosic ethanol production, and distillers' dried grains with solubles, the co-products from corn ethanol industry.

Prof. Manjusri Misra researches "green" nanotechnology at the Bioproducts Discovery and Development Centre using pilot plant equipment that converts plant material into prototypes of new products. Waste biomasses from soy, corn and wheat have been used to make bioplastics and green composites to produce bumpers, seats, dashboards, other automotive parts as well as sustainable packaging.

Robinson has been following a fall rye crop's growth from the time it's seeded in the fall until it's ready to be rolled down into a uniform mulch layer and used as a cover crop in the spring.

To roll the fall rye into mulch, Robinson and his fellow researchers purchased a specially designed tractor-mounted roller and planter that can precisely flatten the fall rye into a uniform mat layer, as it plants the organic crop seeds at the same time.

"Being able to do a one-pass type treatment will reduce the amount of time this process takes, and even the fuel required," says Robinson. "For a grower with a large acreage crop, this is a big deal."

Additional support is provided by the Ontario Processing Vegetable Growers.

A layer of rye mulch rolled into a mat is an environmentally friendly way to control weeds, says Prof. Darren Robinson.

ALL PHOTOS: MARTIN SCHWALBE

R Agricultural and Rural Policy

The OMAFRA-University of Guelph Partnership supports research in this theme so that government can provide support to Ontario's agri-food industry and rural communities.

Agricultural policy research encompasses many issues related to farming, including agricultural trade and marketing, business and finance, and innovation in economic development. Rural policy research focuses on the challenges and opportunities facing rural Ontario, including current government policies and programs, the impact of climate change, regional development, rural infrastructure, transportation and rural labour markets.

Together, agricultural and rural policy research will provide up-to-date, factual information for government decision makers.

Supporting local food from Ontario farms

BY HAYLEY MILLARD

OMAFRA funding and research at the University of Guelph are helping find ways to put local food on the tables of Ontarians.

To provide Ontario consumers with fruits and vegetables year-round—even outside traditional growing seasons—processors import about 80 per cent of their produce. The Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) wants to encourage the sector to use more local food, and more directly support the agri-food sector which contributes more than $33 billion to the Ontario economy and employs almost 750,000 people.

The local food movement encourages consumers to buy more foods grown or produced domestically and sold locally. It supports farmers and helps consumers get more value for their purchased products with enhanced quality and food safety.

At the Premier's Summit on Agri-Food Innovation in April, OMAFRA announced $24 million over three years would go to develop the logistics of a local food distribution system that would get more Ontario-grown food into schools, hospitals, food service companies and other institutions.

A University of Guelph research team, led by Prof. Karen Landman from the School of Environmental Design and Rural Development, is evaluating existing models of local food systems and their best practices. Her research team is looking to determine which models already exist, the best practices they're implementing and how they're functioning to help OMAFRA understand what's happening across the province, and to share the information with research participants.

"The local food movement is a grassroots movement and municipalities and provincial ministries need to know what's happening on the ground," says Landman. "Interviewing those directly involved in the local food movement will help us understand these developing food systems. We hope the research will benefit everyone involved in food—from the producer to the consumer."

Her research team believes the biggest challenge facing the feasibility of a local food movement is an effective distribution system as well as local processing. Many small processing operations, such as Canning and Abbatoirs, are shutting down, making it extremely difficult to fulfill this part of the distribution chain.

Under the Agriculture and Rural Policy research theme of the OMAFRA - U of G agreement, the researchers' work will provide insights for tapping into this new economic opportunity. The research theme also focuses on government policies to remove barriers or encourage entrepreneurial success.

The Ontario government has also outlined its intent to work with farmers to help them sell their locally grown products, by supporting Farmers' Markets Ontario and the Ontario Farm Fresh Marketing Association. Throughout 2008, OMAFRA worked with commodity organizations to facilitate marketing programs to ensure more Ontario-grown products met or exceeded consumer expectations.

Canada's strict regulations on pesticide use make fruits and vegetables grown in Ontario preferable to imports. For example, pesticides are regulated by Health Canada under the *Pest Control Products Act*, and are among the most stringently regulated substances in Canada.

The government has now strengthened and broadened its marketing definitions of Ontario food to help industry participants better sell their products, which also now helps consumers better identify what food is produced in Ontario. More Ontario foods—such as meat, dairy, eggs and bakery products—are using the Foodland Ontario brand in their marketing.

Looking into the future of local food promotion, OMAFRA has geared its Ontario Market Investment Fund towards supporting regional local food initiatives. These activities could put more local foods on restaurant menus, creating maps to show where local produce is being sold in select areas, and conducting media, trade and culinary events. R

PHOTO: FARMERS' MARKETS ONTARIO

Farmers adapt as cities grow

BY KYLE MAW

As urbanization becomes more prevalent, farmers are taking positive approaches to help protect the environment, and keep peace with their new neighbours. That's the word from University of Guelph researchers, studying the habits of 16,000 Canadian farmers.

Profs. Brady Deaton and Alfons Weersink, Department of Food, Agricultural and Resource Economics, are focusing on how farmers are adopting new environmental practices, based on the level of urbanization they're encountering. They've found that farmers bordering urban areas are embracing new environmental programs to a greater degree than their counterparts in more remote, rural areas.

Weersink says farmers on the rural-urban fringe are more likely to use programs that can help guide and document their efforts to improve their environment. Among the most popular approaches are better odour controls, soil sampling to check nutrient availability, improved irrigation methods and manure storage practices.

"Farmers are using these programs as a proactive means of showing they are good neighbours, and good stewards of the land," says Weersink.

His findings are based on responses of Canadian farmers in a Statistics Canada survey. Eight types of environmental management systems were researched, including manure, fertilizer, pesticide and water management plans. The survey collected data on the use of environmental management systems and a host of other variables such as farm type and demographics.

Weersink found that as the distance to an urban centre became shorter, farmers were more likely to adopt environmental practices. He also found that mixed farms, which specialize in more than one commodity, have the highest adoption rates.

A program that's been particularly successful with farmer uptake is the Ontario Environmental Farm Plan (EFP). It was introduced by farm organizations in the early 1990s, with Prof. Gord Surgeoner of the University of Guelph as the scientific lead, to guide and help document farm practices. Through local workshops, farmers emphasize their operations' environmental strengths, identify areas of concern and set realistic goals with time lines to improve conditions.

Additional support is provided by Agriculture and Agri-Food Canada and Statistics Canada.

Many farmers bordering urban areas are using environmental initiatives such as tree barriers to build positive relations with their neighbours.

Prof. Wayne Caldwell is developing a guide to help Ontario landowners improve water quality problems.

Working together for better water

BY ARTHUR CHURCHYARD

Complaints about nutrient overloading and soaring bacteria counts along Great Lakes shorelines are growing across Ontario. As waterfront properties get snapped up, population pressures intensify and urban encroachment becomes chronic. Water quality deteriorates for all users, and cottagers and farmers point fingers at each other. Frustration escalates, and answers are elusive.

Against this backdrop, University of Guelph researchers are working to break down misunderstandings between rural groups and to encourage land stewardship on all sides. Prof. Wayne Caldwell of the School of Environmental Design and Rural Development is developing a guide based on his studies of Huron County that could be used across Ontario to prompt landowners to take responsibility for their own contributions to water quality problems.

Part of the study involves conciliatory aboriginal-like circle talks. They put all participants on an equal footing and promote discussion because, in this configuration, everyone's voice is heard.

"This project is about each of us as landowners, thinking about the daily decisions we make that contribute to water quality," says Caldwell. "We can't simply point fingers at a group such as farmers when our own actions are part of the problem."

Cottagers are often the most vocal about water quality problems, he says. That's why the first part of his research considers the impact of cottagers on water quality, using a septic re-inspection program.

A stewardship guide has also been prepared, based on workshops in which participants provide feedback on what problems exist in their area, the problems' source and what they can do to help.

Additional support is provided by the Ontario Ministry of Natural Resources and many local groups and private organizations, including Friends of the Bayfield River.

PHOTOS: TOP – ONTARIO FARM ANIMAL COUNCIL | BOTTOM – MARTIN SCHWALBE

OMAFRA and the University of Guelph's environmental sustainability research theme focuses on maintaining the ability of natural resources—soil, air, water and biodiversity—to support and strengthen the agriculture, food and bioproduct sectors, and rural communities. To protect Ontario's diverse environment, researchers provide science-based direction for government policies and legislation.

Population growth presents opportunities for new markets and challenges for agriculture and the environment. The OMAFRA-University of Guelph Partnership aims to balance the needs of people and the agri-food industry with environmental priorities in order to achieve sustainable agriculture and food production.

Shades of grey

Can reclaimed water work for irrigation?

BY KATHARINE TUERKE

Field irrigation and water conservation sound like strange bedfellows, but not if the irrigation water is reclaimed water. It's a practice used in Europe and some areas of North America. And Prof. Katerina Jordan, Department of Plant Agriculture, thinks it deserves more attention here in Canada, too.

This spring and summer, Jordan and student Patrick Schwieder will be testing the effects of reclaimed water on turfgrass growth and soil quality. The water used will come from three sources: an animal processing plant in Cambridge, Guelph's waste-water treatment plant and roadway runoff that is channelled into an irrigation pond.

Reclaimed water contains nutrients useful for plants' growth and fertility. Jordan says using this water for field irrigation is a more practical choice than using municipal water supplies, which should be conserved for drinking water.

"Recycled waste water, runoff and animal processing waste water are all potential irrigation alternatives to municipal or natural water sources," she says. "But first we need to understand the environmental implications of irrigating with these types of reclaimed water."

Schwieder will test the environmental effects of the three reclaimed water sources by introducing each to different turfgrass plots at the Guelph Turfgrass Institute and Environmental Research Centre. Turf quality, growth rate and root depth will be assessed before and after the water treatment.

He'll also investigate the effects of reclaimed water on soil microbial populations. And finally, he wants to determine if higher nutrient levels found in some types of reclaimed water would change plant tissue levels and the soil micro-organisms involved in nitrogen cycling. That would affect the amount of fertilizer required for field crops.

Schwieder, who hopes to be conducting this study as his master's thesis research, will be working alongside Jordan and Prof. Eric Lyons, Department of Plant Agriculture. Prof. Kari Dunfield, Department of Land Resource Science, has also collaborated on this study.

Additional support is provided by the Ontario Turfgrass Research Foundation.

Patrick Schwieder will be testing the effects of reclaimed water on turfgrass growth and soil quality in Guelph this spring and summer.

PHOTO: MARTIN SCHWALBE

Premium compost

Researcher finds new use for mushroom production leftovers

BY KATE ROBERTS

Prof. Ron Fleming has found a way to break down leftover organic substrate used for growing mushrooms to produce premium compost.

Canadian mushroom growers now have a profitable option when it comes to dealing with the leftover organic matter used to grow mushrooms.

Prof. Ron Fleming of the University of Guelph's Ridgetown Campus has found that spent mushroom substrate—a manure-based material—can be fully composted to produce a high-quality product that can be sold at a premium.

"Composting can give mushroom growers an alternative method of dealing with this substrate while providing an additional income source," says Fleming.

On a world scale, about 13.6 million tonnes of mushroom substrate are produced each year, he says. Normally, it's disposed of, spread on farmland or sometimes sold to other farmers.

When applied to land, spent mushroom substrate improves soil structure by increasing the water- and nutrient-holding capacity and adds organic matter. It's more consistent than many other compost products because the mix recipe stays fairly constant year-round.

As a bonus, it's free from weeds and disease because it's already been partially composted and fully pasteurized before being removed from the mushroom house.

Because of the compost mix recipe needed for mushroom production, however, the finished compost has a higher salt content than other composts. This can put some limitations on how the compost can be used. In the past, the industry has dealt with the high salt content by stacking spent mushroom substrate outside for at least six months, allowing precipitation to leach out the salt. But this approach creates concerns related to Ontario's Nutrient Management Act because of the potential for water contamination.

So in 2005, the Canadian Mushroom Growers' Association asked Fleming to find other options for the waste material.

He found that a complete composting process could be used to improve the soil application qualities of spent mushroom substrate. The substrate was mixed and aerated for four weeks to create premium compost. In Ontario, selling this material in bulk garners up to $60 per tonne.

"Composting is safer for the environment and results in finished compost that has an excellent feel and appearance. Branding this as superior to other composts will be the ultimate factor in whether farmers can reap benefits."

Additional support was provided by the Canadian Mushroom Growers' Association and Rol-Land Farms.

Pollutants take flight

Researcher examines internal and external air quality impacts from the poultry industry

BY ASHLEY MORIN

Livestock operations are becoming increasingly intensive. Ammonia and particulate matter are two pollutants being released into the environment by livestock operations, and they've been deemed toxic in their emitted forms by the Canadian Environmental Protection Act.

University of Guelph Prof. Bill Van Heyst, School of Engineering, is investigating how intensive animal housing contributes to air pollution, specifically by releasing ammonia and particulate matter. He's focusing on best management practices that poultry broiler houses can implement to better control ammonia and particulate matter emissions from the barn itself, as well as best practices for manure storage and application.

Preliminary results revealed that ammonia reacting with acidic gases in broiler barns contributes to fine particulates in the exhaust.

In fact, Van Heyst learned from the Alberta Ministry of Agriculture, Food and Rural Development that more than 70 per cent of anthropogenic or man-made ammonia emissions come from the agriculture industry—a significant number, given the boom in business in the past decade.

With best management practices, livestock operations can reduce toxic pollutants like ammonia and particulate matter from being released into the environment.

Van Heyst's early investigations of fine particulate matter at a broiler barn located just outside of Guelph led him to believe that ammonia is contributing to secondary aerosols in poultry houses. He's now looking at the complete cycles of ammonia and particulate matter to determine how they spread throughout the air—from where the particles are most concentrated in poultry houses to how they're rising into the air during manure storage and application.

When his research is complete, Van Heyst hopes to provide the industry with guidelines every poultry housing facility could follow to improve air quality by decreasing ammonia and particulate matter emissions.

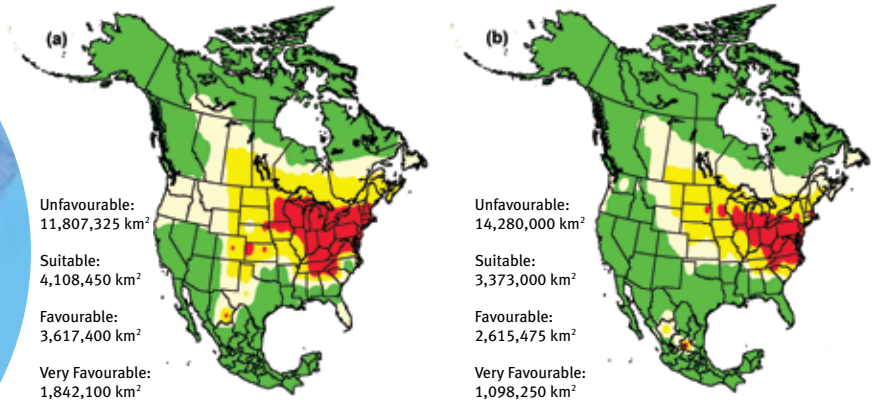
Additional support was provided by the Poultry Industry Council and the Canadian Poultry Research Council.

PHOTOS: TOP – MARTIN SCHWALBE | BOTTOM – OFAC ANIMAL AGRICULTURE PHOTO LIBRARY

The goal of emergency management research under the OMAFRA-University of Guelph Partnership is to provide a proactive, coordinated and comprehensive approach to managing agri-food emergencies in Ontario. Events such as SARS, BSE, swine and avian influenza and invasive plant pests have shown Canadians the profound impact that outbreaks can have on agriculture, the environment, human health and the economy.

Emergency management research encompasses issues related to zoonoses and public health, foreign animal disease, plant pests, and food safety. The focus is on disease agents and pests whose sudden emergence or re-emergence in Ontario requires an immediate and comprehensive response.

Climate projection models for swede midge populations



Different climate projection models predict different impacts on pest populations, such as the swede midge, depicted here, which can cause serious crop damage or loss. The insect was first identified in Ontario in 2000 by U of G Prof. Rebecca Hallett, Department of Environmental Biology, who has also contributed to Prof. Jonathan Newman's research on climate impacts.

Climate change

WHAT A PEST

BY SARAH VAN ENGELEN

Climate change is a hot topic these days. At the University of Guelph, scientists are looking ahead to map out how changes in the environment could influence future insect populations—particularly the troublesome ones.

Prof. Jonathan Newman, Department of Environmental Biology, and master's student Anna Mika are exploring how atmospheric conditions affect the location of invasive, endangered and native insect species. Insects are greatly influenced by changes in climate and predictions about their future distribution and impact are determined using bioclimatic envelope models, which provide an outlook based on climate change projections.

These projections are computer model outputs developed for the Intergovernmental Panel on Climate Change (IPCC). Under the IPCC, 31 models can be accessed by researchers to study how climate change will affect species and ecosystems.

When using various climate models based on the same climate data, Newman and Mika found very different biological impacts for the pests they are studying.

"What seems like a small difference in climate projections between the climate models can mean a large change in the ecology of a species," says Newman, explaining that the difference in results means that researchers need to be more thorough in their approach to predicting climate change impacts.

Newman believes that researchers need to use many climate model projections, which, although they may provide different results, will lead to some pest risk predictions that are common to all model projections and can help target potential problems before they start. Scientists must consider more than just temperature to determine how insects will be affected, he says. Humidity, soil moisture, precipitation and the movement of other pests all are influencing factors.

Says Newman: "If we can determine which pest will be a problem with future climate change and which won't, then we can start taking measures such as breeding plants to be resistant for problems that may come 20 years down the road."

Additional support is provided by Natural Sciences and Engineering Research Council.

MAP: ANNA MIKA | PHOTO: REBECCA HALLETT

In pursuit of a coccidia vaccine

Guelph researchers take new approach to fight coccidiosis

BY MATT TEETER

A coccidia vaccine that's less susceptible to resistance and does not have growth-inhibiting side effects may be within reach of University of Guelph researchers.

Coccidiosis is a major parasitic infection that costs the poultry industry worldwide more than $1 billion a year. Live coccidiosis vaccines can protect chickens against coccidiosis, but they can hinder bird growth. And parasites in general are developing resistance to many of the commonly used anticoccidial drugs in the poultry industry. Against this backdrop, the public wants food free from medicinal residue, including the drugs used to prevent coccidiosis.

To make an effective vaccine that avoids these hurdles, Prof. John Barta, Department of Pathobiology, and his students are taking a new approach.

"We identify differences between strains of parasites and then go back to see if these differences can be used to create a protective immune response," says Barta.

The differences are between two strains of *Eimeria maxima*, one of the four important species of coccidia that infect chickens.

Coccidiosis is a major parasitic infection that costs the poultry industry worldwide more than $1 billion a year.

While the strains are largely identical in the proteins they express, they each produce unique immune responses in birds. That means a bird protected through immunity against one strain won't be protected against the other. Barta hopes the few differences identified between the strains may show the way towards immunologically important antigens.

Working with Prof. Bill Hargis of the University of Arkansas, Barta will use a modified strain of salmonella to deliver the targeted protein and other antigens to the chickens' intestines. All of the disease-causing parts of the salmonella are removed, leaving a harmless but effective antigen delivery vehicle. After exposure, the chickens will produce an immune response that will protect them against coccidia, without any of the resistance problems common to anticoccidial drugs or the production loss associated with live vaccines.

The vaccine won't completely block parasitic infection. Instead, it will reduce the number of parasites infecting the birds, minimizing damage and decreasing mortality. This has other positive effects, too, as fewer parasites are then available to be transmitted to other birds.

Additional support was provided by the Natural Sciences and Engineering Research Council.

Against the wind

Researchers prepare Ontario's soybean crop for airborne Asian rust invasion

BY KYLE MAW

The wind. When it comes to soybeans, there blows the problem.

Asian soybean rust, a fungal disease spread by wind-borne spores, can be devastating to a soybean field. It kills plants' leaves, leading to yield losses of up to 80 per cent.

And it's on its way to Ontario. The disease has been reported across Asia, Australia, Africa and South America. Now it's in the Midwestern United States, arriving from Colombia on the winds of hurricane Ivan in 2003.

In 2007, the unthinkable happened—some spores were identified on a soybean plant in Ridgetown. But they didn't manifest themselves into a big problem—in fact, in 2008, none were found. However, it's felt that a two-year drought in the southern US has kept the disease from developing further, and when the drought ends, the problem will escalate.

Luckily for Ontario growers, the spores can't survive in freezing conditions. That's given them more time to prepare. Since 2004, the soybean industry and the international research community have been creating what's described as an unprecedented defense plan for the disease. It includes a step-by-step plan to monitor and research the progression of soybean rust, then to inform and educate growers on how to manage the disease.

At Guelph, Prof. Istvan Rajcan and Albert Tenuta, OMAFRA Field Crops Pathology Lead, have been studying and identifying soybean varieties that are resistant to rust, with help from the US Department of Agriculture. Resistant varieties have been identified from a gene bank of soybeans taken from many different regions around the world. Many of those varieties may be fit for Ontario conditions.

"Having the ability to evaluate genetic resistance from other varieties allows us to speed up development of new varieties before the disease arrives in Ontario," says Rajcan.

Additional support was provided by Canada and the Province of Ontario under the Canada-Ontario Research and Development (CORD) Program. The Agricultural Adaptation Council administers the CORD Program on behalf of the province.

PHOTO: J.R. BARTA, PATHOBIOLOGY, OVC

Knowledge Translation and Transfer

BY ELIN GWYN

Accelerating the transformation of knowledge into use – that's Knowledge Translation and Transfer (KTT).

KTT is a new emphasis in the partnership between OMAFRA and the University of Guelph.

KTT is the synthesis, exchange and application of knowledge resulting from interactions among university researchers, OMAFRA, stakeholders of OMAFRA, the University of Guelph and the public. It goes beyond traditional rural and agricultural extension; in fact, it begins by working with researchers at the very beginning of the research process and moving the research results into possible intellectual property development, policy changes or improvement to agricultural or food processing practices.

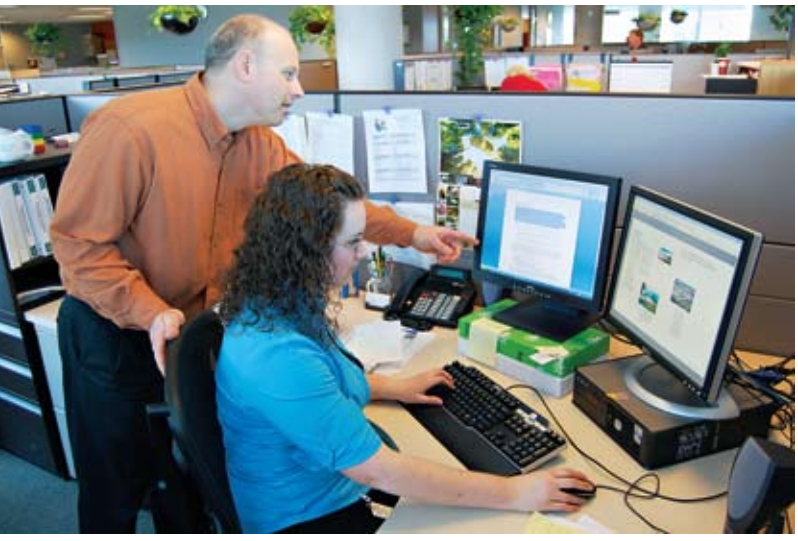
A team of OMAFRA and University of Guelph staff are working to increase the practical application of knowledge created from research. KTT initiatives draw on successes elsewhere, to encourage the synthesis and movement of research into tangible products and actions.

Keith Reid, OMAFRA Soil Specialist, discusses soil fertility with farmers and other agri-industry members during the annual FarmSmart Farming Systems Expo at the Elora Research Station.

Success will result from employing knowledge brokers and involving stakeholders throughout the knowledge development process. By encouraging an open, collaborative sharing culture, the KTT program will create more communication and synergy among researchers, OMAFRA and stakeholders.

OMAFRA and U of G have a track record of agricultural extension, technology commercialization and intellectual property development. KTT will result in increased and faster research applications.

Highly Qualified Personnel Program



The University of Guelph's HQP program for graduate students will broaden their skills and workplace experiences to complement their academic training.

BY ROB CUNNINGTON

The skill set required of many of today's employees is increasingly diverse. One answer to the challenge is the new Highly Qualified Personnel (HQP) program being developed at the University of Guelph. It's designed to enhance the skills and knowledge of graduate students to improve their competitiveness and readiness for employment in the public and private sectors.

Through the program, students will gain an understanding of how research findings can be translated into public policy. They'll learn first hand about real-world regulatory requirements, commercialization, and entrepreneurial opportunities and challenges. Networking with public sector and industry representatives, they'll be encouraged to engage in collaborative research projects. Mentoring, job shadowing, and internship prospects will familiarize students with employment prospects and may inspire new areas of interest.

All of this experience will create a well-rounded graduate, ready to contribute effectively to Ontario's agri-food industry.

PHOTOS: TOP – IAN MCDONALD | BOTTOM: REMO PALLOTTINI

Veterinary Clinical Education Program

The Ontario Veterinary College (OVC) has been a world leader in veterinary health care, teaching and research since 1862. The college works at the intersection of animal, human and ecosystem health, training veterinarians and scientists to improve the health of companion animals, ensure food safety and protect the environment.

The Ontario Ministry of Agriculture, Food and Rural Affairs supports the college's Veterinary Clinical Education Program and the referral veterinary teaching hospital. The hospital is a key component in the training of undergraduate veterinary students, graduate students, interns and residents. It also serves veterinarians and animal owners in Ontario, Canada and the US. As part of their training, student veterinarians work closely with clinical faculty who provide a wide array of services to food animal, equine and companion animals in Ontario.

With the clinical training programs, veterinary students spend their entire final year rotating through the hospital clinical services to gain front-line experience. In addition to this comprehensive program, students are also required to complete an externship, spending eight weeks in a private primary care, mixed species practice.

OVC's post-graduate training programs raise the standard of veterinary health care and related public health in Ontario by graduating highly qualified personnel. OVC graduates contribute knowledge, expertise and experience to further the understanding of the complex relationships between humans, animals and the environment.

A first-hand account of a veterinary externship

Gaining practical experience for career success

BY KELLY BARRATT

Kelly Barratt participated in a study trip to the University of Minnesota's Transition Management Facility to gain practical experience as part of her veterinary training.

For students like me, practical experience can be vital for finding the "light at the end of the tunnel." That's where the externship program supported by the OMAFRA-U of G Partnership's Veterinary Clinical Education Program comes in.

Externships are completed by all veterinary students, before they start their fourth and final year at OVC. Through this program, I spent eight weeks at a mixed animal veterinary clinic in Listowel, Ontario. I had the opportunity to work with many great veterinarians and I was able to apply what I had learned during the first three years of my DVM degree. It helped me gain more of the practical experience that I needed to become a successful practicing veterinarian. With many programs, students don't get the chance to have this hands-on experience and see exactly what they will be doing after they graduate.

Being able to go out and apply all the skills I had learned at OVC helped me to stay motivated. It was inspiring to see what we could achieve once we received our degrees. I now work as a large animal vet at the Listowel Veterinary Clinic/Fairles Veterinary Services where I completed my externship placement.

The on-farm experience as a large animal veterinarian has shown me that I can make a difference—not only with farm families, but with their livelihoods and the agricultural industry as a whole.

PHOTO: UNIVERSITY OF MINNESOTA

Water

Where city meets country

The OMAFRA-University of Guelph Partnership is committed to enhanced water quality in Ontario. Researchers are looking for answers to many complex questions, including:

- **how land use practices affect water levels**
- **the pathway and fate of contaminants**
- **how climate change impacts water management**

Read more about the partnership's research priorities at

- **uoguelph.ca/research/omafra/themes_priorities**

Find out more about the OMAFRA-U of G Partnership at

- **uoguelph.ca/research/omafra**
- **omafra.gov.on.ca/english/about/uofg**

Ontario

UNIVERSITY of GUELPH

CHANGING LIVES IMPROVING LIFE

Read more about the partnership's commitment to water research in the water management issue of *Research* magazine, posted at uoguelph.ca/research/learn/index.shtml