

ANNUAL REPORT

2014-2015



UNIVERSITY OF ALBERTA
DEPARTMENT OF AGRICULTURAL,
FOOD & NUTRITIONAL SCIENCE

Leader's foreword

With pride, I give my first report as Chair of the Department of Agricultural, Food and Nutritional Science. In AFNS, we continue to fulfill our mission by having remarkable success in all areas of Human Nutrition, Food Science and Bioresource Technology, Plant Biosystems and Animal Science. Our success is built on the work of our excellent faculty and support staff who continue to teach and train our students and conduct research.

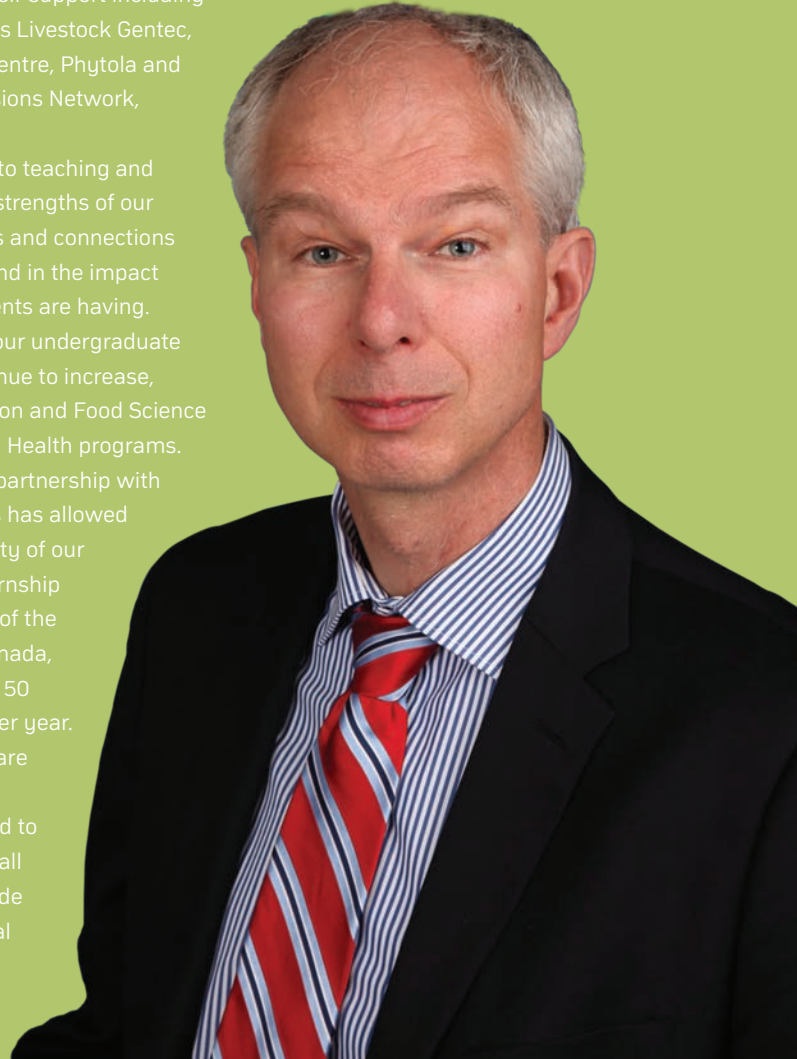
In 2014–15, AFNS faculty members attracted nearly \$25 million in external research funding, an average of more than \$400,000 per faculty member. It's an outstanding achievement. The impact of our resulting research on Alberta and the world includes discovering more about the links between food and health, developing value-added products from agricultural residues, enhancing the health and quality of livestock and developing new disease-resistant and higher yielding cultivars better suited to our climate.

AFNS can now count on more than 100 members from industry, NGOs, government agencies and other universities among its many partners.

We're grateful for all their support including major initiatives such as Livestock Gentec, the Poultry Research Centre, Phytola and the Biorefining Conversions Network, among others.

AFNS' commitment to teaching and learning is seen in the strengths of our programs, partnerships and connections with our community, and in the impact that our amazing students are having. Our future is bright as our undergraduate student numbers continue to increase, especially in the Nutrition and Food Science and Agriculture/Animal Health programs. In addition, our strong partnership with Alberta Health Services has allowed us to double the capacity of our Integrated Dietetic Internship Program. It is now one of the largest programs in Canada, enabling us to produce 50 Registered Dieticians per year.

In this report, we share some of our newest stories. We look forward to continue working with all of our partners to provide solutions that have local and global impacts.



MISSION STATEMENT

To serve the community through excellence in teaching and research in efficient and sustainable agricultural production, value-added processing, food safety, human health, and to improve the health and quality of life.

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ANIMAL SCIENCE

Team Members

- JUDD AIKEN** Prion Disease
- DIVAKAR AMBROSE** Reproductive Physiology and Management
- BURIM AMETAJ** Ruminant Nutritional Immunology
- LORNE BABIUK** Immunology, Pathogenesis, Virology, Molecular virology and Vaccinology
- DAN BARREDA** Immunology
- URMILA BASU** Manager, Lab and Genomics and Proteomics Unit
- CLOVER BENCH** Applied Ethology/Animal Behaviour
- HEATHER BRUCE** Carcass and Meat Science
- WALTER DIXON** Molecular Biology
- MICHAEL DYCK** Reproductive Physiology/Biotechnology
- CAROLYN FITZSIMMONS** Beef Genomics
- LELUO GUAN** Functional Genomics and Microbiology
- JOHN KENNELLY** Dairy Cattle Nutrition and Metabolism
- DOUG KORVER** Poultry Nutrition
- CHANGXI LI** Bovine Genomics
- MASAHITO OBA** Dairy Nutrition and Physiology
- ERASMUS OKINE** Cattle Nutrition and Metabolism
- GRAHAM PLASTOW** Animal Genomics
- FRANK ROBINSON** Poultry Management/Physiology
- MICHAEL STEELE** Ruminant Nutrition
- PAUL STOTHARD** Bioinformatics
- RICHARD UWIERA** Veterinary Pathology
- ZHIQUAN WANG** Beef Quantitative Statistical Genetics
- CRAIG WILKINSON** Director of Animal Care
- BENJAMIN WILLING** Canada Research Chair, Epigenomics/Nutrigenomics
- RUURD ZIJLSTRA** Ingredient Evaluation and Carbohydrate Nutrition
- MARTIN ZUIDHOF** Poultry Science/Bioeconomic Modeling

A close-up, profile view of a woman in a laboratory setting. She is wearing a white lab coat, a grey hairnet, and safety glasses with 'D&G' on the side. She is wearing purple nitrile gloves and is focused on dissecting a piece of raw meat on a white surface with a pair of forceps. The background is slightly blurred, showing other lab equipment and another person in a white lab coat.

MEaTnet fulfilling promises in its first year

Graduate studies
project in meat science
attracts industry,
students



Canada's first and only specialization for graduate studies in meat science turned a year old last September and by several measures, it's firmly on the road to success.

"The feedback from industry has been outstanding," said **Heather Bruce**, director of the Meat Education and Training Network, known informally as MEaTnet. "The word is getting out."

Bruce, who is an associate professor in carcass and meat science, said that industry quickly stepped up to support the specialization and its mandate. It exists to create highly trained potential managers for the meat industry who enter armed with cutting-edge skills and the latest research.

Industry support has come in the form of mentorships, placements, graduate research assistance and skills workshops.

While MEaTnet's initial partners are large-scale industry members such as JBS, Champion Petfoods and Maple Leaf Foods, small-sized and family-owned companies are inquiring about involvement, too.

Other yardsticks of MEaTnet's success lie in its enrolment, which includes both Canadian and international students.

Eight graduate students (four master's and four PhDs) are completing its inaugural year, and a healthy stream of inquiries through the recently launched website are reinforcing Bruce's plans to produce 50 graduates in six years.

"I think we're easily on track because some of our students are getting other scholarships, so we're able to take more (students) and are encouraging as many as possible to apply," said Bruce.

In the graduate student stream, both master's and PhD students take a common curriculum. Courses include communicating scientific concepts to laypeople, practical skills (such as meat-cutting and understanding the food

animal value chain), professional business skills, and a webinar course on current topics in meat science.

Graduate students must also spend 20 per cent of their time in the specialization working for an industry partner, and also present papers at both national and international conferences.


Meanwhile, three undergrads at the U of A are currently enrolled in the MEaTnet potential graduate student feeder stream, which involves four months of summer study, including a short industry placement.

Future plans include offering refresher skills to existing meat industry personnel via modular, online delivery, said Lisa Bowker, MEaTnet's program coordinator. Such courses would give industry personnel information specific to Canadian grading, safety and control systems.

While it's based in the Department, MEaTnet is a virtual network that includes students from the universities of Saskatchewan, Guelph and Laval. It's funded through a \$1.65 million grant from the Natural Sciences and Engineering Research Council of Canada.

Industry support has come in the form of mentorships, placements, graduate research assistance and skills workshops.

The Meat Education and Training Network is off to an excellent start in fulfilling its objective of producing 50 graduates in six years. Inset: Heather Bruce, meat scientist and Director of MEaTnet



Livestock Gentec discovers how to select for problem porcine disease

Graham Plastow, CEO of Livestock Gentec

Scientists at Livestock Gentec, working with an international consortium, have pinpointed which animals are susceptible to porcine reproductive and respiratory syndrome virus (PRRSV), the most widespread problem disease in pigs worldwide.

In North America, it accounts for an estimated \$700 million in lost production annually.

By sequencing the genomes of 350 Canadian bulls, the Livestock Gentec team — including bioinformatician **Paul Stothard** and **Leluo Guan**, an expert in functional genomics and microbiology — developed next generation sequencing technology that enabled them to analyze blood samples to provide a window on health and disease in animals.

The scientists developed a new method to filter out the

most abundant protein in blood in order to better detect differences for other genes expressed in whole blood.

“We then compared the gene expression of genes in whole blood from pigs infected with PRRSV, comparing those that got very sick with those that were still growing,” said **Graham Plastow**, CEO of Livestock Gentec.

In one of the genes that was always more abundant in the less-susceptible animals, the scientists discovered there was a mutation that altered the function of the gene in the susceptible animals.

The technology has been directly commercialized by Livestock Gentec’s partners, who represent the largest pig breeding companies in the world.



“My involvement with the student clubs, that was huge. Basically everything I did as a member of those clubs is what I do now in event planning.”

JACOB ONYSCHUK '13 BSc (Ag) Animal Science

ALUMNI PROFILE

Jacob Onyschuk

'13 BSc (Ag)
Animal Science

CURRENT POSITION:

Agriculture Event Co-ordinator, Northlands

Jacob co-ordinates all of the agriculture events run by Northlands. While liaising with exhibitors ensures smooth operations, an ongoing part of his job is brainstorming new ways to move agriculture education into a modern era. “Agriculture is incredibly broad and there are tons of people who are never exposed to it.”

HOW HE GOT THERE:

While studying, Jacob belonged to the Agriculture Club, Multi-Species Judging Club and Collegiate 4-H Club. In 2012, he won the Premier's Award as the top 4-H member in Alberta. He was recognized for his animal projects, his public speaking skills, for facilitating workshops and chairing the Northwest Regional Beef Committee. He also volunteered with Northlands' Farm and Ranch Show for three undergrad years, facilitating its multi-species competition. Northlands hired him full time, months before graduation.

THE EDGE AFNS PROVIDED:

“My involvement with the student clubs, that was huge. Basically everything I did as a member of those clubs is what I do now in event planning. And having a background in animal science is extremely applicable when you're looking at the bio-security implications of having thousands of animals on site. Having an understanding of animal behavior, of how they move or may balk at certain things, it makes for a set-up that is more user-friendly for the exhibitor.”





Immunologist Dan Barreda and Maria Cavaco

Vitamin D metabolite found to improve weaner pigs' immunity

A new study concludes that vitamin D, especially when consumed as an active metabolite, improves immunity in weaner pigs.

"This shows the contribution of vitamin-D supplemented diets to immune defenses early in the development of pigs, when they are most vulnerable to infection," said immunologist **Dan Barreda**, who led the study.

Vitamin D has historically been provided to swine and poultry for bone strengthening.

Barreda and his team worked in collaboration with DSM Nutritional Products Ltd. and looked at their vitamin D nutrition supplement, Hy-D, which is a vitamin D metabolite.

They monitored three groups. While each group was fed a

conventional diet, the first group received minimum accepted vitamin D supplementation while the second one was given enhanced vitamin D levels. The third group was provided with Hy-D, a vitamin D metabolite.

Barreda and his group found that Hy-D got absorbed very well by weaner pigs and positively modulated their immune responses.

To assess the contributions to immunity and animal health, Barreda and his team used a technology platform they developed that increased their ability to observe the piglets' white blood cells, how quickly they came to sites of infection and how well they responded. This platform enables Barreda and his team to make concrete suggestions on product optimization.

FOOD SCIENCE AND BIORESOURCE TECHNOLOGY

Team Members

MARLENY ARANDA-SALDAÑA Food/Bio
Engineering Processing

MIRKO BETTI Muscle Food Science &
Processing

DAVID BRESSLER Fermentation &
Bio/Food Engineering

HEATHER BRUCE Carcass & Meat Science

LINGYUN CHEN Canada Research Chair,
Plant Protein Chemistry & Technology

JONATHAN CURTIS Lipids & Analytical
Chemistry

MICHAEL GÄNZLE Canada Research
Chair, Microbiology & Probiotics

LYNN MCMULLEN Food Microbiology

LECH OZIMEK Dairy Processing
Technology & Food Product Development


FERAL TEMELLI Food Process
Engineering

AMAN ULLAH Utilization of Lipids,
Polymer / Material Chemistry

THAVA VASANTHAN Grain Science &
Technology

WENDY WISMER Sensory & Consumer
Science

JIANPING WU Food Protein Chemistry

A woman with short dark hair, wearing a white lab coat over a black and white striped shirt, is smiling at the camera. She is in a laboratory setting, with various pieces of equipment visible in the background, including a scale labeled 'Practum' and a water bottle. She is holding several slices of bread on a white wire rack. The text 'AFNS team finds key to tasty salt-reduced bread' is overlaid on the image.

AFNS team finds key to tasty salt-reduced bread

Sourdough made from specific bacteria
does the trick



AFNS food scientists discovered how to reduce salt in sourdough bread by half without compromising its taste or texture.

The trick, revealed food microbiologist **Michael Gänzle**, is to add bacteria that produce a taste-compound called glutamate.

Gänzle, along with sensory and consumer scientist **Wendy Wismer** and PhD candidate **Cindy Zhao**, compared two strains of *Lactobacillus reuteri* that differ only with respect to glutamate accumulation. They confirmed what had long been suspected: the product of bacterial fermentation that produces savoury taste is glutamate.

“What consumers told us is that there is a difference when there’s glutamate present.”

The team also found it’s possible to reduce salt levels from two to one per cent without harming the taste or texture of the bread.

“What consumers told us is that there is a difference when there’s glutamate present, and if the glutamate is present they thought the intensity of the salty taste is higher,” said Gänzle. “That confused us, because glutamate is a savoury taste, not a salty one.”

Zhao worked with a panel of trained tasters who can discriminate and measure minute differences in taste. They discovered that sourdough with the same salt levels as regular bread actually tasted saltier.

“So it means that the sourdough bread with glutamates does enhance the salty, because it tasted saltier,” said Zhao.

Therefore, reducing the salt would not unduly affect the taste. As for the texture, it was maintained because the sourdough can decrease the pH and also produce the sugar residues that contribute to the texture.

For consumers, the research means that they can have healthier bread without sacrificing taste or texture. A bread industry firm in Europe is now testing the *L. reuteri* bacteria for that purpose.

Meanwhile, Zhao is conducting more research on *L. reuteri* and the ability of sourdough bacteria to produce taste-active peptides, including recently discovered peptides with taste-enhancing properties called kokumi. Its properties may allow her to bake bread with further improved taste.

PhD candidate Cindy Zhao



Potato by-products produce eco-friendly plastic films

Using potato peels and culls considered waste by Alberta's potato-processing industry, AFNS researchers have created a starch-based bioactive film that is both eco-friendly and rich in antioxidants.

With applications for both the food packaging and cosmetic industries, the new bioactive film is a green alternative to traditional petroleum-based plastics and possesses added advantages, said AFNS researcher **Marleny Aranda Saldaña**.

"Development of antioxidant and antimicrobial bioactive films can improve product shelf life and safety," she said.

"Potato peels have high phenolic content, a natural compound for plant protection, which you also find in apple peels and grape peels, among others."

Saldaña and her team, which includes food microbiologist **Michael Gänzle** and cereal scientist **Thava Vasanthan**, used subcritical fluid technology to extract phenolic compounds from the potato biomass.



Marleny Aranda Saldaña, PhD candidate Yujia Zhao and MSc student Carla Sofia Valdivieso Ramirez

“Development of antioxidant and antimicrobial bioactive films can improve product shelf life...”

In subcritical water medium, starch can be modified to influence the film’s properties, such as its tensile strength, elongation, antioxidant and antimicrobial activity.

Saldaña’s team has obtained an international Patent Cooperation Treaty application for the processing method and is commercializing the process.

Since there’s international interest on whether the subcritical method would also work on cassava, her team is studying that too.

Saldaña’s research is being funded by Alberta Innovates – Bio Solutions and NSERC.

ALUMNI PROFILE

Bernhard Seifried

'10 PhD

Food and Bioresource Engineering

CURRENT POSITION:

Senior Research Scientist, Ceapro Inc.

Bernhard is the co-inventor of a novel platform processing technology called Pressurized Gas eXpanded Liquid Technology, or PGX. It is a unique technology that can be used to process biopolymers into high-value, nano-sized polymer structures and novel bio-nanocomposites.

Local biotechnology company Ceapro has already used PGX to produce a high-purity dry oat beta glucan that can be developed to act as a delivery system for the cosmetic and healthcare markets, and as a systemic active ingredient with potential health benefits such as cholesterol reduction.

HOW HE GOT THERE FROM HERE:

Bernhard earned his PhD in Food and Bioresource Engineering from the University of Alberta. His doctoral advisor was AFNS researcher Feral Temelli, with whom he developed PGX. With his thesis work as its basis, they applied for a patent which was recently approved. He joined Ceapro in 2010, where he has since designed all the equipment and modifications required to scale-up PGX for commercial applications.

THE ROLE OF AFNS IN HIS SUCCESS:

“Dr. Temelli is a wonderful mentor who had faith in me exploring and developing novel methods and technologies, providing the right balance of guidance and freedom.” Additionally, “I learned not only from AFNS’s many skilled professors, but from my opportunity to teach students. AFNS has been a great environment for me to grow, start a great professional career and establish a lifelong relationship with the researchers in the department.”





PhD candidates Lihui Du, Meng Meng Feng and Henan Wang, and postdoctoral fellow Abhishek Bhattacharjee, second from left.

Researchers perfecting new methods to reclaim animal collagen for skin, bone and food care

Meat scientist **Mirko Betti** and his research team are developing a new, more efficient way to extract collagen from bovine hides and poultry byproducts.

“Collagen is an important protein that can be recovered and modified to something that can be beneficial to us in terms of skin regeneration and to alleviate joint pains,” said Betti. “It can also be used as a natural health product and eventually a food ingredient.”

Betti and his team are trying to bind natural chemical compounds to collagen through a unique functionalization process. It would allow the collagen to move from the blood stream to the target tissue.

As far as Betti knows, his team is the only one attempting this functionalization of collagen peptides. And his team is also examining other potential uses for collagen including examining the anti-freezing capabilities of collagen peptides, which might allow it to protect food from freezing damage. It’s also researching whether iron can bind to the peptides, so that it can be delivered more efficiently to target populations such as anemics or pregnant women.

“This potentially represents an extra source of profit for the meat industry,” he said. “From something that’s low-value.”

The research is being funded by the Alberta Livestock and Meat Agency, and Alberta Innovates Bio Solutions.

“Collagen is an important protein that can be recovered and modified to something that can be beneficial to us in terms of skin regeneration and to alleviate joint pains.”

A close-up photograph of a white bowl filled with a fresh salad. The salad includes sliced avocado, pieces of cooked chicken, green peas, and other vegetables. The bowl is set on a wooden table. A yellow banner with the text 'HUMAN NUTRITION' is overlaid on the image.

HUMAN NUTRITION

Team Members

Heidi Bates Director, Integrated Dietetic Internship

Rhonda Bell Human Nutrition

Jean Buteau Human Nutrition

Cathy Chan Human Nutrition

Anna Farmer Community Nutrition

Catherine Field Nutrition & Metabolism

René Jacobs Human Nutrition

Diana Mager Clinical Nutrition

Vera Mazurak Nutrition & Metabolism

Carla Prado CAIP Chair, Nutrition, Food and Health

Spencer Proctor Metabolic & Cardiovascular Diseases

Donna Vine Human Nutrition

Jens Walter CAIP Chair, Nutrition, Microbes & Gastrointestinal Health

Noreen Willows Community Nutrition

Modern sanitation may reduce bacterial diversity in our gastrointestinal tract

While our sanitation and water practices prevent infections and improve our health, they might make us susceptible to other effects





Good sanitation and treated drinking water may be reducing the diversity of beneficial bacteria in our gastrointestinal tract.

A study led by AFNS' **Jens Walter** found that adults from the United States lacked approximately 50 bacterial types that were key members of the gut microbiota found in adults of two rural, non-industrialized regions of Papua New Guinea.

The study also found that the ability of bacteria to move from individual to individual appears to be the main reason for the difference in gut bacteria collections in each population.

It is possible that North America's modern sanitation and water practices might be limiting the ability of beneficial bacteria to be transmitted among humans, said Walter. While these practices prevent infections, and are a key feature of a westernized lifestyle that contributed to improvements in overall health and life expectancy, they might make us susceptible to other effects.

“Some scientists have hypothesized that modern lifestyle might predispose us to chronic lifestyle diseases like obesity and type-1 diabetes.”

“Some scientists have hypothesized for some time now that modern lifestyle might deplete the human gut microbiota, and by doing this, might predispose us to chronic lifestyle diseases like obesity and type-1 diabetes that are increasing in westernized societies.”

In fact, several recent studies have consistently shown that non-westernized human populations have more diverse microbiomes.

“There are several aspects of western lifestyle that have been hypothesized to alter the gut microbiome and decrease diversity,” said Walter. “These include diet, sanitation, and clinical practices such as antibiotic use and caesarean sections, but we lack a conceptual understanding of how our microbiomes are altered.”

However, Walter said it's important to be cautious about questioning modern lifestyle practices. Non-industrialized societies have a high incidence of infectious diseases, including life-threatening diarrhea. Research is therefore necessary to determine how to prevent the negative impact of westernization on our microbiome while preserving its benefits.

PhD candidate Rebecca Duar and microbial ecologist Jens Walter

Pregnant and lactating Alberta women not getting enough fatty acids

New ALES research reveals almost 75 per cent fall well below recommended levels

An overwhelming number of pregnant and lactating women in Alberta are not meeting the recommended intake of omega-3 fatty acids vital to their babies' development and to their own health, according to new research.

Nutrition researcher **Catherine Field** led a study which found that only 27 per cent of Alberta women were meeting the recommended minimum of 200 mg per day of DHA during pregnancy. By three months postpartum, that had dropped to 25 per cent.

“(Omega-3 fatty acid) DHA is also important to a mother’s health. Low levels in the body have been associated with depression.”

DHA is the major omega-3 fatty acid required during pregnancy for fetal and placental development, and is critical for infant brain development and other growth in every cell of the body.

“DHA is also important to a mother’s health,” said Field. “Low levels in the body have been associated with depression.”

The recommended intake of DHA during pregnancy could be met by consuming one to two portions per week of fish that are high in omega-3 fatty acids. Health Canada cites the best sources as salmon, tuna, herring and trout.

The study was conducted as part of Alberta Pregnancy Outcomes and Nutrition, a project studying more than 2,000 women and their infants funded by Alberta Innovates Health Solutions.



Nutrition researcher Catherine Field



ALUMNI PROFILE

Casey Berglund

'11 BSc (Ag)

Food and Nutrition

CURRENT POSITIONS:

Registered Dietitian, owner of nutrition and wellness company Worthy and Well, media commentator on nutrition and a spokesperson for Dietitians of Canada.

HOW SHE GOT THERE:

After graduating with a degree in Nutrition and Food Science and obtaining her Registered Dietitian designation, Casey completed training in multiple yoga disciplines, dispensed freelance nutrition counselling and worked part-time as a dietitian for Alberta Health Services.

Then she launched a blog about nutrition, mindfulness and yoga, held cooking classes and started speaking about nutrition in the media and for the Dietitians of Canada. Working for a private clinic, she offered nutrition counselling to executives and developed a yoga program for stress management. In January 2015, she opened her own company, combining counselling on nutrition and mindful eating with yoga practice to show women how to have a healthy relationship with food.

THE VALUE OF HER AFNS STUDIES:

Doing practicums in clinical nutrition, a community placement in a seniors home food facility, some public education in schools and a three-month internship at Misericordia Hospital — all as part of her degree and internship — laid the foundation for her current career, says Casey.

“Had I not had the experience in my schooling and practical experience in my internship, I would not have the confidence to do one-on-one counselling and group talks.”



Hulls of pea seeds lower blood-sugar levels considerably

People with type 2 diabetes might be able to reduce their dependence on glucose-regulating drugs due to a new discovery by nutritionist **Cathy Chan** and plant physiologist **Jocelyn Ozga**.

Their recent research shows that by cooking certain types of pea-seed coats or by breaking them down through hydrolysis, they can enhance the fibrous material's ability to lower blood-sugar levels.

This prepares the way to developing appealing food products for diabetics that can help them control their levels of blood sugar.

Earlier studies by Chan and Ozga determined that raw pea-seed coats reduce blood sugar in rats by about 15 per cent. However, raw pea-seed coats are not very digestible by humans.

But if the coats of some pea-seeds are cooked, there's a reduction of 20 to 25 per cent in blood sugar. If other pea-seed coats' large flavonoid molecules are broken down through acid-hydrolysis, then the reduction is slightly higher, 25 to 30 per cent.

The findings are significant for people with type 2 diabetes, who are usually treated with a prescription drug called metformin, which allows the body to use insulin more effectively, along with diet and exercise. Identifying foods or ingredients that also lower blood-sugar levels could reduce the need for the drug.

Research shows that by cooking certain types of pea-seed coats or by breaking them down through hydrolysis, they can enhance the fibrous material's ability to lower blood-sugar levels.



Plant physiologist, Jocelyne Ozga



PLANT BIOSYSTEMS

Team Members

EDWARD BORK Mattheis Chair in
Rangeland Ecology & Management

CAMERON CARLYLE Rangeland Ecology

LINDA HALL Environmental Biosafety
and Integrated Weed Management

BARRY IRVING Manager, Research
Stations

NAT KAV Biochemistry & Biotechnology

JOCELYN OZGA Plant Physiology &
Horticultural Science

HABIBUR RAHMAN Canola Breeding &
Research

DEAN SPANER Plant Breeding & Organic
Agriculture

STEPHEN STRELKOV Plant Pathology

RANDALL WESELAKE Canada Research
Chair, Agricultural Lipid Biotechnology

RONG-CAI YANG Statistical Genomics &
Quantitative Genetics

Grassland researchers help settle global debate on biodiversity

Findings refute a four-year-old paper, which concluded that empirical patterns between biodiversity and productivity are weak and inconsistent.





Working with a large network of scientists worldwide who studied grasslands of every type in all climate zones, rangeland ecology researchers **Edward Bork** and **Cameron Carlyle** helped reaffirm a theory of diversity that had been under attack.

They've confirmed that the humped-back model of diversity, which states that plant diversity peaks in grasslands of intermediate (medium) productivity, while high- and low-productivity grasslands tend to have fewer plant species, is accurate.

"Working with an unusually large network of data we were able to see that pattern," said Carlyle who, along with Bork, took samples at the Department's Mattheis Research Ranch in southern Alberta.

"We were also able to conclude that the pattern held across a wide range of spatial scales within these grasslands."

"We were also able to conclude that the pattern held across a wide range of spatial scales within these grasslands."

The data set also included samples from the Department's Roy Berg Kinsella Research Station in central Alberta (see story on p. 36). All told, the landmark study involved 62 scientists from 19 countries and six continents, who examined 30 sites. The findings refute a four-year-old paper, which concluded that empirical patterns between biodiversity and productivity are weak and inconsistent.

"It's important to come to a consensus on the pattern because it changes how we might look at, interpret and manage, low-, moderate- and high-productivity sites, particularly if the conservation of plant diversity is an important objective," said Bork, who is the Mattheis Chair in Rangeland Ecology and Management.

For instance, under the humped-back model, conservation of overall plant diversity may be more dependent on strategically retaining and enhancing grasslands of intermediate productivity. Meanwhile the conservation of biodiversity in high- and low-productivity sites may focus particular attention on a smaller group of plant species to ensure their functional role in the ecosystem is maintained.

Many other management decisions on grasslands are also dependent on knowing whether there's a vital relationship between biomass and biodiversity, said Bork.

Rangeland ecology students study grasslands as part of a worldwide effort to settle an old debate

Elzbieta Mietkiewska, a Research Associate with Phytola, isolated three genes from pomegranates and incorporated them into high-value oilseed crops adding punicic acid to its list of nutritional benefits.

Punicic acid is a polyunsaturated fatty acid that has been found to help slow the growth of skin, prostate and breast cancer cells. Until now, it was only found in pomegranates and Chinese cucumber seed oil.

Elzbieta Mietkiewska isolated three genes containing punicic acid and incorporated them into high-value oilseed crops.

Mietkiewska's experimental plants, in which she inserted the three genes, accumulated up to 25 per cent punicic acid in the oilseeds that initially contained no punicic acid at all.

Punicic acid also assists with weight loss, has anti-inflammatory characteristics, and can even act as a chemical agent that can help paints dry quicker.

Because of punicic acid's unique benefits and the progress made so far in Canadian oilseed crops, interest in Mietkiewska's research is quickly growing.

Mietkiewska, who has a patent pending on the discovery, is confident that in the coming years, the oilseed crops that Phytola is developing in partnership with Alberta Innovates Technology Futures, will make products containing punicic acid easier to access and help more people capitalize on their benefits.



Discovery adds health benefits to common Canadian crops

Research Associate Elzbieta Mietkiewska

In addition to the nutritional value they already contain, common Canadian crops like canola and flax may soon have cancer fighting benefits too.



“My education and the networks made through my PhD research opened many doors and provided me with opportunities which led to my current career.”

BARBARA ZIESMAN '11 BSc (Ag) Crop Science and current PhD student commenting in the advantages of AFNS

ALUMNI PROFILE

Barbara Ziesman

'11 BSc (Ag)

Crop Science and current PhD student

CURRENT POSITION:

Provincial Specialist, Oilseed Crops for the Government of Saskatchewan

Barb's portfolio covers canola, mustard, flax, sunflower and other oilseed crops as *carinata* and *camelina*. Her responsibilities include delivering extension education — presenting to farmers and agronomists and writing fact sheets and other materials on hot issues and best management practices — and keeping the provincial agriculture minister informed on issues concerning oilseed crops.

HER ROUTE THERE:

After completing an undergrad in biology, Barb refined her knowledge at AFNS with a BSc Agriculture, majoring in Crop Science. With two years' preparation for a master's under her belt, she impressed her advisors with her research skills and transferred directly into a PhD. Her thesis, scheduled for completion in early 2016, focuses on her development of a quantitative (q)PCR assay to detect the fungus *Sclerotinia sclerotiorum* on canola petals. The hope is that the (q)PCR assay can be used as a tool to forecast the disease so that fungicide can be applied proactively.

THE ADVANTAGES OF AFNS:

“At the U of A, I developed the skills to think critically and at AFNS I was introduced to many issues facing farmers in Western Canada. My education and the networks made through my PhD research opened many doors and provided me with opportunities which led to my current career.”





Researcher focuses on DNA methods to combat clubroot

Plant pathologist Stephen Strelkov

By analyzing DNA extracted from dust soil ... Strelkov and his team showed for the first time that clubroot spores can be quantified and measured in windborne dust.

AFNS plant pathologist **Stephen Strelkov** is working on DNA-based tools to fight clubroot, canola's most significant threat.

By analyzing DNA extracted from dust soil samples in 2011 and 2012, Strelkov and his team showed for the first time that clubroot spores can be quantified and measured in windborne dust.

That's significant because it demonstrated that clubroot spreads mostly through infested soil carried by farm machinery, and that the disease needs a host.

Strelkov monitors about 400 fields every year. He found a new strain of clubroot in a resistant variety of canola in 2013. Nine more strains were found in fields across a 600-kilometre stretch in central Alberta in 2014.

“We would like to develop molecular markers to distinguish the strains. It would make a time-consuming and labour-intensive process much quicker.”

Since 2015 was such a dry year, it's possible the clubroot infestation won't be as severe this season, says Strelkov. But the pathogen spores can stay dormant in the soil for up to 20 years, waiting for enough moisture and the presence of host roots to germinate and cause infection.

So a race is on between its spread and that of DNA-based tools to detect it and react.

“We would like to develop molecular markers to distinguish the strains,” said Strelkov. “It would make a time-consuming and labor-intensive process much quicker.”



2014-15
HIGHLIGHTS

Two international experts join AFNS

Two young international scholars joined the Department of AFNs in 2014–15, thanks to the Campus Alberta Innovation Program.

After completing her PhD in the faculty six years ago, Brazilian **Carla Prado** returned as the newly appointed CAIP Chair for Nutrition, Food and Health. She'll examine the interaction between abnormal body composition—ratios of muscle and fat tissues—and overall health, paying particular attention to the role food people eat plays on their body composition, and, in turn, on their health.

Carla Prado will examine the interaction between abnormal body composition and overall health.

Her recent research indicates that abnormal body compositions can occur at all body weights and predict complications in clinical conditions such as diabetes and cancer. "In the future, body composition could be something that we can use during diagnosis to decide the treatment of a patient," she says.





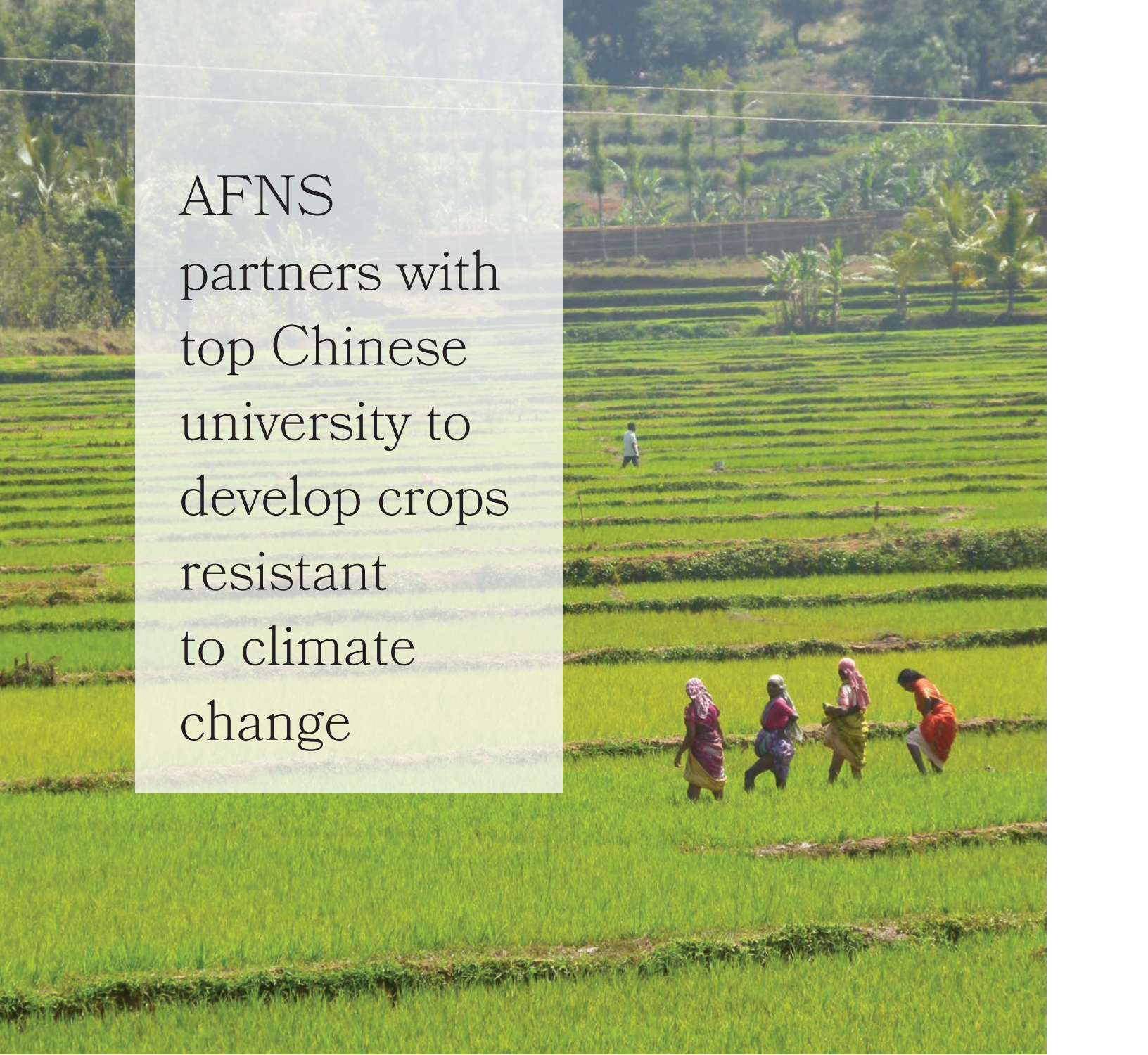
Jens Walter, CAIP Chair for Nutrition, Microbes and Gastrointestinal Health, is starting two research programs to examine the relationship between gut bacteria populations and human health. The German researcher will examine the symbiotic relationship between gut microbes and their host. He'll also identify how diet impacts the microbial communities in the gut and what consequences they have on human health.

Jen Walter will examine the relationship between gut bacterial populations and human health.

Eventually, he anticipates he will design dietary strategies to target gut bacteria.

Walter noted animal models demonstrate gut bacteria can contribute to obesity and autoimmune disorders. He's excited to bridge the gap between these animal models and human applications through his research programs.

CAIP was created in 2011 by the provincial government to recruit new research leaders to Alberta in food and nutrition, energy and the environment, water and neuroscience.



AFNS partners with top Chinese university to develop crops resistant to climate change

A new, joint research centre established by AFNS and one of China's top agricultural university will focus on the development of climate change-resistant crops.

"The world's population is going to hit nine billion by 2050," explained **Nat Kav**, a plant biochemist and biotechnologist who will lead the effort. "Crop productivity is going down as a result of climate change, arable land is decreasing, in China and India, available

"...If we are going to feed nine billion people, we need a serious effort to improve the productivity of crops."

land is in high demand, but many areas may be marginal, with high salt content and temperature changes. So if we are going to feed nine billion people, we need a serious effort to improve the productivity of crops."

The Department is partnering with Northwest Agriculture & Forestry University, one of the top agriculture and forestry institutions in China. It has several of the country's most important laboratories, particularly in the area of



ALES Associate Dean, Academic, Nat Kav, will lead the faculty's activities at the Agriculture and Food Innovation Joint Research Centre, a partnership between China's Northwest Agriculture & Forestry University and the Department of AFNS.

crop science, said Kav. The U of A already has an undergraduate student agreement with the university, so there are now graduate students employed there "who are knowledgeable about our way of doing things."

In addition to providing access to each other's research facilities and expertise, the centre will facilitate the exchange of information between the two institutions, the submission of joint research proposals to funders, and the

joint supervision of graduate students. Over the next five years, it is hoped three to five students from both institutions will receive training through the centre.

Agriculture program consistently among world's best

The Department's programs continue to rank among the world's best, according to the 2014 rankings from National Taiwan University, the world's most respected university rankings.

Overall, the University of Alberta's agriculture program was ranked 41st in the world. In the past four years, the University of Alberta's agriculture program has consistently ranked between 39th and 41st.

In determining the rankings, National Taiwan University has subdivided the agriculture section into three

sub-fields, namely agricultural sciences, environment/ecology, and plant and animal sciences. The U of A ranked 45th, 35th and 61st respectively.

"Our department is committed to research and teaching excellence and it's gratifying to see all the hard work of our researchers being recognized," said **Ruurd Zijlstra**, chair of the Department of AFNS.

National Taiwan University uses three criteria to determine the rankings, research excellence, research impact and research productivity.

Research excellence is the most heavily weighted criterion, at 40 per cent. It looks at the h-index of faculty members along with the number of highly cited papers and number of articles in high impact journals. Research impact accounts for 35 per cent of the ranking and looks at citations while research productivity, which is weighted at 25 per cent of the ranking, looks primarily at the number of published scholarly articles.



AFNS food science students Minghua Yu, Kaixing Tang and Andrea Roman present their award-winning peamon tart at the annual Mission ImPULSEible student food competition.

Unique pulse dessert takes home top prize

The Peamon Tart has a traditional sour-sweet filling but its gluten-free shell is made from a mixture of canned pulses: red kidney beans, chickpeas, romano beans and great northern white beans.

A bite-sized lemon tart with a crust made of beans and peas earned AFNS food science students the top prize at the regional Mission ImPULSEible competition last year.

“There are a limited variety of gluten-free desserts in the market and we wanted to create a tasty and relatively healthier gluten-free dessert to meet market demands,” said **Kaixing Tang**, one of three students that formed the winning team.

The Peamon Tart has a traditional sour-sweet filling but its gluten-free shell is made from a mixture of canned pulses: red kidney beans, chickpeas, romano beans and great northern white beans.

It took the team between 30 and 40 hours to perfect the winning tart.

Competition judges evaluated the products submitted by three competing teams based on sensory and health attributes, innovative use of pulses, and the feasibility and marketability of the food item. The Peamon Tart entry marketed pulse benefits through a website and a jaunty low-budget video.

Last year’s national winning team was also from AFNS. It won the \$2,500 grand prize with Pulse Pops, a frozen treat consisting of chickpeas, pea butter and soy nuts, wrapped with black bean and cacao and rolled in chocolate and coconut. Previous national winners from AFNS include a team that developed gluten-free chips in 2011.

Mission ImPULSEible is an annual competition staged by Pulse Canada and the Alberta Pulse Growers to promote the benefits of pulses.

Grad students take home first annual Alberta Barley scholarships

Two AFNS graduate students are among the first-ever recipients of a scholarship for their research benefitting the barley industry.

Masters student **Laurel Perrott** and PhD student **Alireza Akhavan** are two of the three recipients of the brand-new Alberta Barley Scholarships.

synergies that increase barley production in Alberta and hopefully increase profitability for farmers too,” said Perrott.



MSc student Laurel Perrott is one of two AFNS graduate students, along with PhD candidate Alireza Akhavan, who were awarded an Alberta Barley scholarship.

“We’re hoping to find treatment synergies that increase barley production in Alberta and hopefully increase profitability for farmers too.”

Perrott’s project involves conducting intensive agronomic practices to increase yields for feed barley. The practices will take place over three years in four sites across Alberta and will include combining high fertilizer rates with plant growth regulators, foliar fungicides, high seeding rates and different barley varieties. The first field season was last summer.

“We’re hoping to find treatment

Akhavan, who is in the fourth year of his PhD program, is studying the fungal pathogen that causes net blotch in barley, which he estimates costs Canadian barley producers about \$100 million a year.

Specifically, his project is focused on genetic diversity, fungicide sensitivity and resistance screening. He is currently working on host resistance and fungicide application, which

will benefit prairie barley producers, breeders and the industry.

“If we can reduce the yield loss due to this disease by even 10 per cent, I think I will have accomplished my mission,” he said.

Each Alberta Barley Scholarship is valued at \$2,000. The award was established in 2014 to encourage emerging scientists conduct feed barley-related research.



Research Infrastructure

Animal geneticist Roy Berg gets his due



Clockwise from left: the newly re-named Roy Berg Kinsella Research Station; wheat crops on South Campus; poultry researcher Martin Zuidhof at the Poultry Research Centre, graduate students working in the Meat Safety and Processing Research Unit of Agri-Food Discovery Place.



Berg bought the 6,000-acre Kinsella Research Station, on behalf of the university, in 1960, with provincial government funding.

government funding. He conducted what was at the time highly controversial research, using selective cross breeding on beef cattle to pass on desirable traits from a variety of breeds. It ultimately resulted in a 30 to 40 per cent increase in production.

In 2008, the research facility doubled in size when the university acquired the adjacent property. Today, it is the research home of Livestock Gentec, which seeks to constantly produce healthier, more productive livestock.

The Roy Berg Kinsella Research Station is one of several research facilities operated by the Department. Others include:

Agri-Food Discovery Place, a world class innovative research, training and technology transfer facility specializing in food safety, value-added processing and value-added bio-refining of food and industrial products.

The **Crops and Land Resource Unit** supports research in agronomy and breeding to improve the sustainable

production and quality of forage, cereal, oilseed and horticulture crops.

The **Human Nutrition Research Unit** is a state-of-the-art research and training facility that supports nutrition research in, but not limited to, adult and child-related health concerns including diabetes, cancer, cardiovascular disease and obesity.



Fifty-four years after a young U of A animal geneticist obtained funding to buy a ranch, traveled the province and found the perfect piece of land to conduct his cattle research program, he got his due.

In August 2014, the Kinsella Research Station was re-named the Roy Berg Kinsella Research Station during a ceremony attended by more than 350 people.

Berg bought the 6,000-acre Kinsella Research Station, on behalf of the university, in 1960, with provincial



Cattle graze at the Rangelands Research Institute – Mattheis Ranch in southeast Alberta. Inset: A student conducts research in the Swine Research and Technology Centre on South Campus.

The **Poultry Research Centre**, which supports research in reproductive efficiency, controlled environment, nutrition, production efficiency and economics, value-added product development, packaging and food safety. It houses a technology centre, a hatchery, environmental chambers and more.

The **Swine Research and Technology Centre** supports research in swine production efficiency and sustainability, feeds and feedstuff utilization, as well as reproduction and breeding herd management. It houses swine facilities, laboratories and a surgery and interpretive unit.

The 12,000-acre **Rangelands Research Institute – Mattheis Ranch** supports research in grazing system production, reclamation, drought management and water conservation, and business diversification, all with a goal of enhancing the long-term economic and environmental sustainability of rangeland.

The 800-acre **St. Albert Research Station**, located just north of St. Albert, supports agronomic and environmental research.

Other research infrastructure includes the plant growth facilities, the plant pathology lab and the many laboratories in the Agriculture/Forestry Centre and other university buildings that support research in food microbiology, product development, consumer and sensory evaluations, and genomics and proteomics.



- 1 LINGYUN CHEN** Canada Research Chair in Plant Protein Structure Foundation and Nutraceutical Delivery
- 2 DIANA MAGER** Excellence in Nutrition Support Education Award, *American Society of Parenteral and Enteral Nutrition*
- 3 LINDA MCCARGAR** Earl Willard McHenry Award for Distinguished Service in Nutrition, *Canadian Nutrition Society*
- 4 CARLA PRADO** Campus Alberta Innovation Chair for Nutrition, Food and Health
- 5 SPENCER PROCTOR** Simon-Pierre Noël Lectureship, *Canadian Lipoprotein Conference*
- 6 HABIBUR RAHMAN** and **7 DEAN SPANER** Honorary Lifetime Memberships, *Alberta Seed Growers Association*
- 8 STEPHEN STRELKOV** (and AFNS adjunct professors **SHEAU FANG HWANG** and **RON HOWARD**) Achievements in Plant Disease Management, *Canadian Phytopathological Society*
- 9 JENS WALTER** Campus Alberta Innovation Chair for Nutrition, Microbes and Gastrointestinal Health
- 10 BEN WILLING** Canada Research Chair in Microbiology of Nutrigenomics & Faculty of ALES Research and Innovation Award
- 11 RANDALL WESELAKE** Fellow, *American Oil Chemists' Society*

Distinctions

The following AFNS faculty members were awarded distinctions in 2014-15:



AFNS Partners and Funders 2014–15

Agriculture and Agri-Food Canada	Canadian Food Inspection Agency	International Life Sciences Institute
Acadian Seaplants Ltd.	Canadian Foundation for Dietetic Research	Kellogg Company
Agriculture Funding Consortium:	Canadian Institute of Health Research	Kidney Foundation of Canada
• Alberta Barley Commission	Canadian Liver Foundation	Lilydale Inc. — A Sofina Foods Company
• Alberta Canola Producers Commission	Canadian Poultry Research Council	Linnaeus Plant Sciences Inc.
• Alberta Chicken Producers	Canadian Swine Research and Development Cluster	Manitoba Canola Growers Association
• Alberta Crop Industry Development Fund	Canola Council of Canada	Maple Leaf Foods Inc.
• Alberta Innovates-Bio Solutions	Cargill Limited	McGill University
• Alberta Livestock Meat Agency	Centre for International Forestry Research	Merck Animal Health
• Alberta Milk	Champion Pet Food LP	Merck Frosst Canada Ltd.
• Alberta Pork	Chemtura Canada Co.	Michael Foods, Inc.
• Alberta Pulse growers Commission	Climate Change and Emission Management Corporation	Mitacs Inc.
• Alberta Wheat Commission	Dairy Farmers of Canada	Monsanto Canada Inc.
• Egg Farmers of Alberta	Dalhousie University	National Centre of Excellence BioFuelNet Canada
• Western Grains Research Foundation	Danisko UK Ltd.	National Institute of Health
Alberta Agriculture and Rural Development	Danone Institute	National Pork Board
Alberta Centre for Child, Family and Community Research	Diabetes Quebec	National Research Council of Canada
Alberta Enterprise and Advanced Education	Diamond V Mills Inc.	Natural Sciences and Engineering Research Council of Canada
Alberta Hatching Egg Producers	Dow AgroSciences Inc.	Novozymes A/S
Alberta Innovates-Health Solutions	DSM Nutritional Products	Olds College
Alberta Innovates-Technology Futures	DSM Nutritional Products	PIC USA Inc.
Alberta Pacific Forest Industry Inc.	Ducks Unlimited Canada	PigGen Canada
Alberta Pork	Dupont Pioneer	Pioneer HiBred Production LP
Alberta Turkey Producers	Egg Farmers of Alberta	Poultry Industry Council
Alberta Vista — A division of AB Agri. Ltd.	Egg Farmers of Canada	Royal Embassy of Saudi Arabia
Alltech Inc.	Fazer Bakeries	Saputo Dairy Product Canada G.P.
Aviagen Inc.	FMC of Canada	Saskatchewan Canola Development Commission
BASF Canada Inc.	Forge Hydrocarbons Corporation	Saskatchewan Pulse Growers
Bayer Crop Science Inc.	Genesis Inc.	Society to Prevent Dutch Elm Disease
Beef Cattle Research Council	Genome Alberta	Soy 20/20
BioNeutra Inc.	Genome Canada	Syngenta Canada Inc.
Burnbrae Farms Ltd.	Genome Prairie	Teagasc — Agriculture and Food Development Authority
Canada Foundation for Innovation	Heart and Stroke Foundation of Alberta, NWT and Nunavut	TransCanada Pipelines Ltd.
Canada Research Chairs	Heart and Stroke Foundation of Canada	University of Saskatchewan
Canadian Cattlemen's Association	Hieco Ltd — A subsidiary of May-Ruben Technologies	University of Toronto
Canadian Celiac Association	Hospital for Sick Children Foundation	Viterra Inc.
Canadian Fertilizer Institute	Hypor LP	Western Economic Diversification
	International Development Research Centre	

2014-15 FACTS

Department of Agricultural, Food and Nutritional Science

4-10 Agriculture/Forestry Centre

Winter Hours

September 1 - April 30

8:30 am - 12:00 pm and 1:00 pm - 4:30 pm

Summer Hours

May 1 - August 31

8:00 am - 12:00 pm and 1:00 pm - 4:00 pm



RESEARCH FUNDING



\$24,747,400

Total Research Funding 2014–15

\$8,220,659 AB Provincial Government

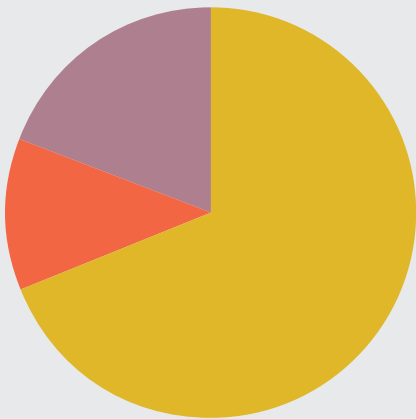
\$5,147,536 Federal Government

\$414,697 Other Government

\$3,226,064 Industry

\$7,738,443 Other

OPERATING BUDGET



\$14,520,858

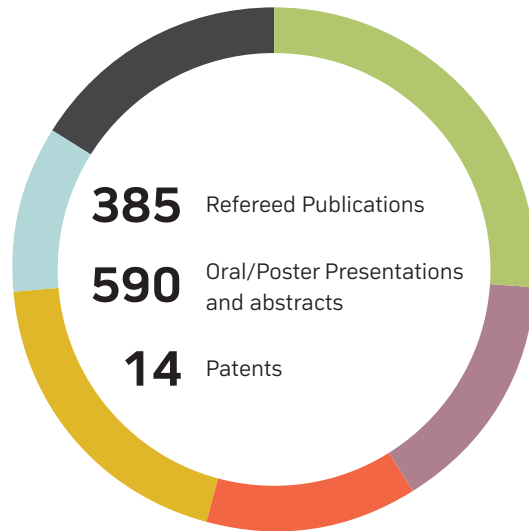
Total Operating budget 2014–15

69% Academic, Administrative & Teaching Support

12% Central Laboratories

19% Research Stations

ACADEMIC STAFF



66 Professors (including AAFC and ARD academic work affiliates/cross and joint appointments)

38 Adjunct Professors

33 Professor Emeriti

49 Post-Doctoral Fellows

26 Research Associates

40 Visiting Scientists

TECHNOLOGY TRANSFER

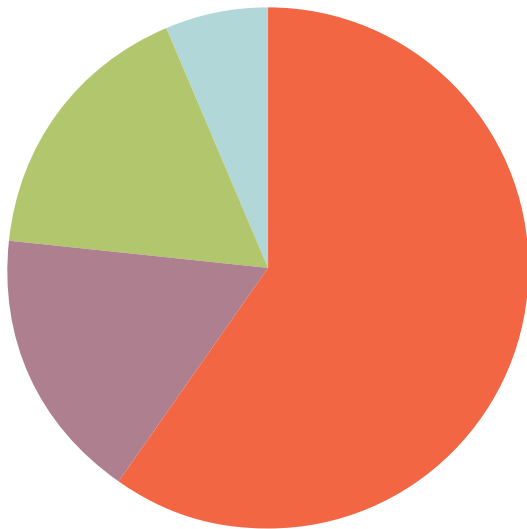


Technologies with Patent Protection Initiated

Investments by TEC Edmonton, Inventors, etc.

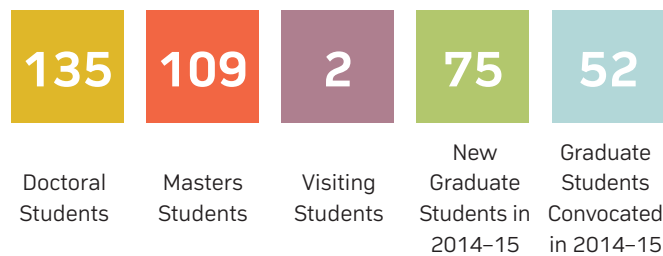
Material Transfer Agreements

UNDERGRADUATES ENROLLED IN DEGREE PROGRAMS



- 536** BSc in Nutrition and Food Sciences
- 154** BSc in Animal Health
- 151** BSc in Agriculture
- 56** BSc in Agriculture/Food Business Management

GRADUATE STUDENT ENROLLMENT



CENTRAL LABORATORIES

- Agri-Food Material Science Unit
- Agriculture Genomics and Proteomics Unit
- Food Science facilities
- Nutrition & Metabolism facilities
- Human Nutrition Research Unit
- Plant Growth facilities

OFF-CAMPUS RESEARCH FACILITIES

- Agri-Food Discovery Place
- Alberta Poultry Research Centre
- Crops & Land Resources Unit
- Dairy Research and Technology Centre
- Laird W McElroy Metabolism & Environment Research Unit
- Swine Research and Technology Centre
- Enclosed Composting Facility
- Feedmill
- Ministik Field Station
- Roy Berg Kinsella Research Station
- St. Albert Research Station
- Rangelands Research Institute – Mattheis Ranch

