



UNIVERSITY OF ALBERTA
DEPARTMENT OF AGRICULTURAL,
FOOD & NUTRITIONAL SCIENCE

ANNUAL REPORT

2015-2016



Message from the Chair

With pride, as Chair of the Department of Agricultural, Food and Nutritional Science, I present our 2015-16 Annual Report.

It's been another excellent year in our department as we continued to provide solutions based on solid science that has had an impact on Alberta and around the world. Highlights include developing value-added products from agricultural commodities, developing new disease-resistant and higher yielding cultivars better suited to our climate, enhancing the health and quality of livestock and discovering new links between food and human health.

Our success is built on our excellent faculty and staff who continue to teach and train students and post-doctoral fellows. Together, they conduct leading-edge research, often with the support of one of our many partners, such as NSERC, ALMA, ACIDF, Alberta Innovates and industry who have funded strategic initiatives such as the Biorefining Conversions Network, Livestock Gentec, the Poultry Research Centre and our first NSERC-Industrial Research Chair, among others.

Indeed, AFNS's commitment to excellence is seen in the strengths of our education and research programs, partnerships and connections with our community, and in the impact of our amazing students who continue to win competitive scholarships and awards.

Our future is bright as our undergraduate student numbers continue to increase, especially for the Nutrition and Food Science and Agriculture/Animal Health programs. Of particular note is our excellent partnership with Alberta Health Services for the Integrated Dietetic Internship of the Dietetics Specialization that trains 50 future Registered Dietitians every year.

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



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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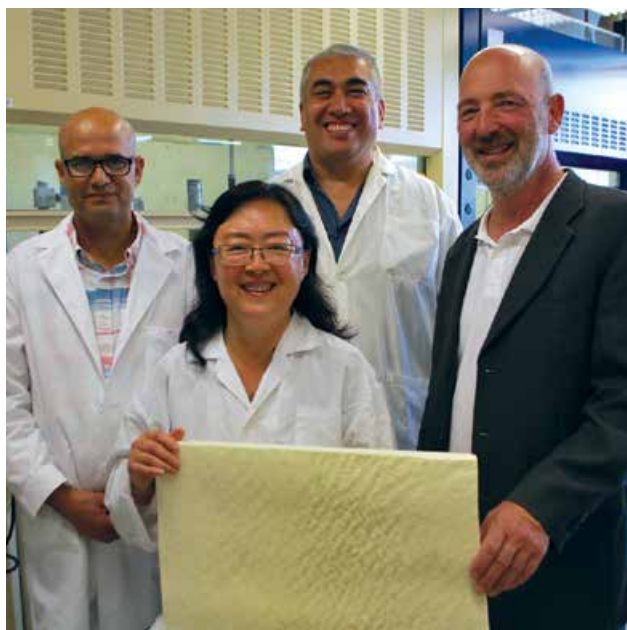
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Food Science and Bioresource Technology

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* | **ROOPESH SYAMALADEVI** *Food Safety & Engineering* | **FERAL TEMELLI** *Food Process Engineering* | **AMAN ULLAH** *Utilization of Lipids, Polymer/Material Chemistry* | **THAVA VASANTHAN** *Grain Science & Technology* | **WENDY WISMER** *Sensory & Consumer Science* | **JOHN WOLODKO** *AITF Strategic Chair in Bio and Industrial Materials* | **JIANPING WU** *Food Protein Chemistry*

Enviro-friendly insulation and roofing panels made from canola oil available soon



▲ TOP: Jonathan Curtis, right, and members of the Lipid Chemistry Group, have developed a bio-based product that is being used to create a bio-based spray foam and roofing panels.

► OPPOSITE: Food microbiologist Lynn McMullen, postdoctoral fellow Ryan Mercer and others made the surprise discovery that not all strains of *E. Coli* are necessarily eliminated when cooked at 71C.

A process invented by AFNS researchers that converts canola oil into organic polyol, or biopolyol, the basis of a greener kind of polyurethane, has been commercialized and used to create two distinct products.

Vancouver-based Consolidated Coatings licensed the process developed by lipid chemist **Jonathan Curtis** and built a plant to produce the biopolyol, now called Liprol™. It is being used, along with other chemicals, to manufacture BioFoam™, a new bio-based spray foam that is 25 per cent bio-based, well above what's currently on the market, said Curtis.

The product should be available for residential applications in two to three years.

BioFoam's insulation value is very high and it also acts as a vapour barrier. Spray foams in general are desirable because they don't compress, sag and lose R-value, in the way fiberglass batting often does, Curtis said.

Edmonton-based Spraysulate and Mod-Panel will make roofing panels and apply versions of BioFoam to other insulation products. Another partner is Green Analytics, which has performed life-cycle analysis on the products and will be involved with future building-energy audits to demonstrate the savings from using BioFoam.

"The great thing about BioFoam is that through Mod-Panel and Spraysulate, we already have markets waiting for the products," said Curtis, who noted that these companies already supply spray foam and roofing panels in Alberta and have established partners across North America who are waiting for BioFoam.

There are many other applications to explore including adhesives, coatings and composite materials so Curtis and his partners expect to be adding to the bio-economy for many years.

Funding for the initial project and its commercialization was provided by the Alberta Crop Industry Development Fund, the Climate Change and Emissions Management Corporation, the NRC's Industrial Research Assistance Program and Alberta Innovates Biosolutions. ■



Ground beef may need higher cooking temperature to be safe

Food microbiologists **Lynn McMullen** and **Michael Gänzle**, along with student Elena Dlusskaya, made the surprise discovery that cooking ground beef at 71C—the level of heat long advised by Health Canada—does not always eliminate all the strains of *E. coli*.

For decades, scientific papers about the thermal killing of microorganisms have noted that there were sometimes survivors.

“We decided to find out why. We looked at the genomes to see what was different,” explained McMullen.

Dlusskaya looked for differences in thermal survival amongst organisms in a large collection of *E. coli* from beef, housed at the U of A.

Working with postdoctoral fellow Ryan Mercer, they discovered a suite of 16 genes that are found only in the highly heat-resistant strains of *E. coli* in fresh meat. This genomic grouping is called the locus of heat resistance, or LHR.

The researchers discovered that it exists in about two per cent of all *E. coli* in the databases and is present in both the harmless and pathogenic strains.

“That means a pathogen could survive the standard cooking protocols for ground beef. It could mean we have to change the guidelines for cooking meat, because 71C may not be enough,” said McMullen.

Funding for the research was provided by ALMA and Alberta Innovates. ■



Tim Lee '08 BSc
Food Science & Technology

When Tim Lee graduated with his BSc in Food Science and Technology in 2008, he landed his dream job: working on the menu development team for a major airline's caterer, stationed in Hong Kong.

It combined his two passions, food and travel, but he grew tired of it within a few short years.

In 2012, he earned an executive education certificate in leadership skills from Harvard University's John F. Kennedy School of Government and then joined the Global Aid Network.

He's now associate director of the network's Water for Life Initiative, which provides water wells and promotes sanitation hygiene and maternal-child health in Benin, Togo, Ethiopia, Tanzania and Thailand. Tim's job is to guide communities and track their progress in using clean water and changing old behaviors.

Tim draws frequently on his food science training as he introduces low-tech methods of conserving water, and rationing and preserving their food.

"Dr. Temelli's course in critiquing journal articles has been very helpful, Dr. Wismer's course in running statistical analysis, that's beneficial," he said.

Even a class in microbiological testing has proved useful. "I can now educate people on potential food dangers." ■

Less expensive barley fibre extract aims to help reduce heart disease and diabetes

People with diabetes and high cholesterol will soon have a convenient and natural tool to manage their health now that an AFNS researcher has commercialized a more cost-efficient way of getting beta glucan from barley grains.

The new product, called Cerabeta™, is a concentrated dietary fibre enriched in beta glucan. Since February, it's been produced in a grain processing plant in Camrose, where automation methods are being perfected.

Plans are to sell it in bulk and via Internet channels within six months, and in grocery stores next year, said Thava Vasanthan, a grain science and technology researcher who developed the new technology for fibre concentration.

Beta glucan is a dietary fibre that exists in oat and barley grains. Scientists have long known that it slows rates of starch digestion and glucose absorption into our bloodstream, which is particularly beneficial for people with diabetes.

Regular consumption of beta glucan also brings down blood cholesterol levels.

Already approved by Health Canada, the U.S. Food and Drug Administration and the European Food Safety Authority, consumers haven't shown any side effects from the product.

Funding for the research and commercialization came from Global Foods, Alberta Innovates Bio Solutions, Canadian Food Innovators and Agriculture and Agri-Food Canada. ■



Human Nutrition

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



Health of immune system of babies tied to moms consuming a specific type of choline



▲ TOP: PhD candidate Erin Lewis discovered that a form of choline may promote greater maturation in immune systems.

► OPPOSITE: MSc graduate student Jasmine Farahbakhsh and community nutritionist Noreen Willows, found that a high number of campus food bank users were moderately or severely food insecure.

The amount and type of choline lactating women consume seems to play a vital role in building their babies' immune function, new research suggests.

A recent study by PhD candidate **Erin Lewis** and nutrition researchers **Catherine Field**, **Rene Jacobs** and analytical chemist **Jonathan Curtis**, showed that a lipid-soluble form of choline—found primarily in egg yolks, beef and chicken—promotes greater maturation of the immune system in offspring of rodents.

“In early postnatal life, there’s rapid development of the immune system, so this is a really critical stage,” said Lewis. “The body’s liver produces choline in small amounts so no one had previously shown that dietary choline was also required to support immune development.”

Choline is a relatively new essential nutrient that is vital to many functions of the human body, from the structure of every one of our cells to nerve transmission. Choline deficiency can lead to fatty liver and muscle damage.

A 2014 AFNS study found that lactating women were getting a mixture of various choline forms in their diet so Lewis and Field focused on the most prevalent forms for more study, specifically phosphatidylcholine (PC) choline found in dairy and meat products, and free choline found primarily in plant foods.

They compared rodents fed PC to those fed free choline and, after three weeks, which is equivalent to about the first year of life in humans, found that when their immune cells were stimulated to induce an immune response, the response in the PC-fed rats was greater and consistent with enhanced immune development.

While more research is required, Lewis says the results of her study suggests lactating women should continue to eat a wide variety of whole foods such as eggs and dairy products, just as Canada’s Food Guide has always recommended. ■



Many Campus Food Bank users too hungry to study

Some University of Alberta students are trying in vain to study because they're hungry and simply don't have enough money for food, according to a recent study.

Community nutritionist Noreen Willows and MSc graduate Jasmine Farahbakhsh found that more than 90 per cent of students who participated in a small sample survey about their use of Campus Food Bank were moderately or severely food insecure, with almost half falling into the latter category.

A lack of funds for food particularly affected students from low- and middle-income families, international and Aboriginal students, and students with children.

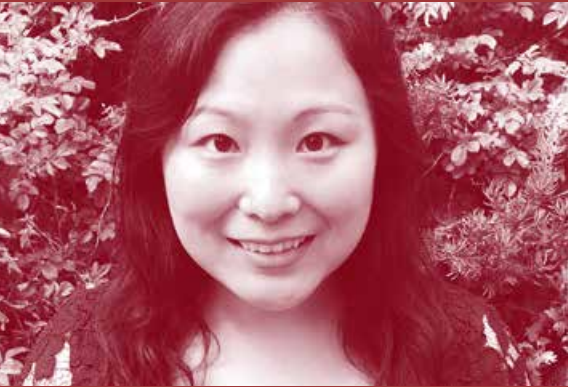
Being physically hungry or "consumed by the chase" of finding and paying for food derails students' primary role, said Willows.

"Even short-term food insecurity has long-term implications on health and well-being, and it doesn't contribute to students performing at their best."

In 2013-14, the Campus Food Bank fielded 73 requests for food hampers each month and served a total of 1,176 people.

Twenty-seven per cent of respondents said they drew on multiple emergency food charities and soup kitchens as campus food bank users are restricted to one basket that has enough food for four days every two weeks.

These findings point to the need for frank discussion on how to make university more affordable, said Willows. ■



Flora Wang '10 PhD
Nutrition and Metabolism

“For my job, you have to be firmly grounded in science and have a really solid training in interpreting scientific evidence and in understanding the human metabolism in relation to disease conditions,” says Flora Wang, manager of nutrition and scientific affairs at the Canadian Sugar Institute, a national not-for-profit association that represents sugar manufacturers.

She’s responsible for providing the scientific support for evidence-based information the institute communicates to health-care professionals, clients and the general public.

Flora earned her PhD in AFNS under the supervision of Dr. Spencer Proctor, working on the health benefits of natural trans fatty acids from dairy products and ruminant meats.

“At AFNS, I was able to get full exposure to the literature, the academic work in basic animal research, and also clinical work. In the clinical trial work, I was able to do everything, from all the ethics documentation to getting involved in various stages of the trials, from initial funding to doing the trial and writing up the results.”

She also credits the efficient mentoring she received from her professors with guiding her smoothly into a satisfying career. ■

Risk of heart disease in overweight kids evident sooner than previously thought

Cardiovascular scientist **Spencer Proctor** and his research team have found a new and better indicator to predict the risk of heart disease later in life for overweight children.

Remnant cholesterol, which is produced by the intestine after eating, can be detected through a protein called apolipoprotein B48.

“We found that when we compared blood sampled from lean children and age-matched overweight children, apoB48 was three times higher in overweight children,” said Proctor who recently tested his finding with another, bigger dataset from the QUebec Adipose and Lifestyle InvesTigation in Youth.

It suggests apoB48 is a more accurate reflection of risk than other traditional

markers, low-density lipoprotein cholesterol, which is produced by the liver.

Current guidelines for early management of cardiovascular disease in children focus on LDL, and often use adult ranges for diagnosis.

Proctor would like family physicians to reconsider how they diagnose the risk of cardiovascular disease in overweight children and to advise families to be more aggressive with lifestyle changes to combat obesity.

“We need to do better at providing more sensitive markers of cardiovascular disease risk in early stages of life so that we have a better chance of avoiding these metabolic problems in adulthood,” he said. ■



Plant Biosystems

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*



Trees and grassland in agricultural landscapes help boost soil carbon storage



▲ TOP: Rangeland ecology and management expert Edward Bork and his team found that Alberta soils could store significantly more carbon than it already does.

► OPPOSITE: Canola breeder Habibur Rahman has developed the first hybrid canola cultivar that offers double-resistance to clubroot.

Alberta soils could store significantly more carbon and provide numerous benefits to farmers and Albertans if trees are integrated into cropland areas, new research reveals.

Scientists looked at the influence of shelterbelts, hedgerows and silvopastures to evaluate the role of trees and different land uses across the agricultural landscape in mitigating climate change, and to see which system is more conducive to carbon storage.

They found that soils under trees stored 36 per cent more carbon.

Rangeland ecologist **Edward Bork**, forest soil scientist **Scott Chang** and researchers **Cameron Carlyle** and **Mark Bahh-Acheamfour** conducted the study over four year in south-central Alberta.

“Trees had the greatest benefit in raising soil carbon levels in agroforestry systems where they were combined with neighboring annual cropland subject to cultivation, while perennial grassland maintained soil carbon levels similar to that of the natural forest,” said Bork.

He added that silvopastures remained the most effective agroforestry system as a whole for storing carbon because trees and grassland, both permanent cover types, were able to accumulate and store large amounts of carbon.

“Because of this, the conservation of existing perennial cover types and avoiding losses associated with cultivation are key to maximizing carbon stores,” he said.

Both Chang and Bork note that the benefits of forest and grassland retention as well as tree planting, extend beyond increased carbon storage and stability.

They said it decreases erosion losses, reduces leaching of nitrate and helps farmers diversify their income now and in the future by having a constant supply of trees to harvest for pulp wood production or saw lumber.

“If landowners increase carbon storage in the soil by having trees or maintaining perennial grassland, it may have value on the carbon market, which in Alberta is projected to rise to \$30 per ton of CO₂ emitted by 2017,” Chang said. ■





New hybrid canola cultivar offers double resistance to clubroot

Crop scientist **Habibur Rahman** has created the first hybrid canola cultivar that offers double-resistance to clubroot, the crop's most significant disease threat.

Developed in partnership with Crop Production Services (CPS) and NSERC, the new hybrid cultivar was made available to growers for the 2016 growing season.

Researchers with the canola breeding program, led by Rahman, studied more than 250 sources of resistance before determining the best two. They worked on the resistance sources separately at first, locating the resistance genes in the chromosomes and developing separate individual canola lines based on the resistance of each source.

"With our partners at CPS, we then combined them to create this hybrid," explained Rahman.

"We expect this hybrid will offer growers more durable resistance," said Bruce Harrison, CPS' director of research, development and innovation.

Clubroot poses a serious threat to the \$6 billion canola industry in Alberta. Nine new strains of the disease that can overcome current resistant lines were found in the province since it was originally detected in 2003.

The research was also supported by the Alberta Crop Industry Development Fund (ACIDF), the Alberta Canola Producers Commission and later, Agriculture and Agri-Food Canada. ■



Warren Bills '04 BSc (Ag)
Crop Science

Warren Bills helps farmers use digital products to increase yield, manage business volatility and increase the efficiency of their operations.

While selling high-volume crop sprayer systems after graduation, Warren taught himself new computerized technology to make farming methods more precise. In 2007, he started GeoFarm Solutions Inc. to help farmers implement precision farming with advice in mapping, satellite imaging, GPS and data management. Agri-Trend bought his business in 2010 and now sells the services he developed under their Geo-Coach® brand.

Today, Warren works for Bayer CropScience Inc. (Canada), in their digital farming business development unit.

"I aim to support the farmers, take away the pain of dealing with the technology and find wins along the way," he said.

He credits AFNS with giving him a solid foundation in agronomy, which has served him very, very well.

"My AFNS studies were rooted in good agronomy by good, knowledgeable people. When I'm having discussions on soil and plant health, weeds, diseases, insects, research methods, or economics there are always those short moments when I recall back to that AFNS class, or that professor who set up that agronomic foundation in my mind." ■

New auxin spray could spell relief for heat-stressed canola

A new spray of a naturally-occurring plant hormone called auxin, developed to reduce heat stress for canola in order to increase its seed yield, has achieved promising results.

Plant physiologist **Jocelyn Ozga** and her team of researchers tested their product under controlled conditions in greenhouses and fields and observed an increase in seed yield between five and 30 per cent.

"Auxin can help the plant keep its reproductive tissues in good shape under higher temperature conditions, and can also help direct the sugars made by photosynthesis to the seeds," said Ozga.

When exposed to heat stress, the plant

usually decreases the level of auxin to reduce growth to prepare the plant to survive the stress condition. Ozga's spray method gives the plant an extra little boost when it most needs it to produce seeds—when the floral buds are visible but it hasn't yet bolted.

However, the seed yield increase is highly variable and also cultivar-dependent, so the researchers' next step is to look at which genotypes consistently react this way, and under exactly which environmental conditions.

Ozga's auxin research has been funded by the Agriculture & Food Council of Alberta, the Alberta Canola Producers Commission and Syngenta. ■



Animal Science

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



Predicting diseases could significantly reduce dairy cow culling



▲ TOP: Nutritional immunologist Burim Ametaj and his research team have made a discovery that could lead to a significant reduction in the number of dairy cows needing to be culled.

► OPPOSITE: A new discovery by PhD student Nilusha Malmuthuge and functional genomics and microbiology expert Leluo Guan, could lead to a substantial decrease in cow calf mortality rates.

Nutritional immunologist **Burim Ametaj** and his research team have discovered how to predict six significant diseases that could significantly reduce the increasing culling of dairy cows in Canada.

Working in a new branch of science called metabolomics, Ametaj and his team measured and analyzed thousands of metabolites—tiny chemical units that are a product of metabolism—in dairy cows' blood, urine, milk and gastrointestinal fluid.

It allowed them to identify significant biomarkers for the six diseases—metritis, mastitis, laminitis, ketosis, milk fever and retained placenta—two months before calving and two months after birth, to predict which cows might be at risk.

"The incidence of culling (due to illness from these diseases) has increased from 25 per cent to more than 50 per cent," said Ametaj, citing information from the CanWest Dairy Herd Improvement Corporation, which provides health and disease diagnostic milk testing services to producers.

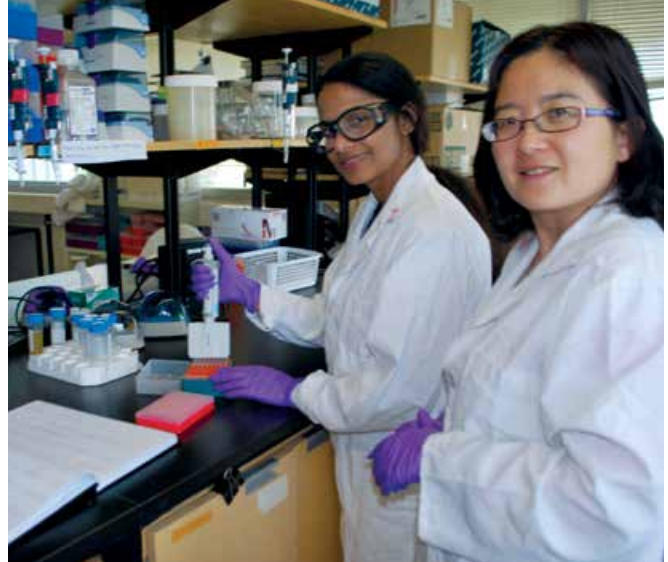
"If a cow used to have a production life of five to six years, now it's down to two or three," he said.

With 900,000 cows in Canada, that represents a significant health concern for the animals and an equally significant economic loss for producers.

Ametaj's next step is to validate the information by testing cows on various conventional farms in Alberta and Canada, to see if the biomarkers identified accurately predict the six major diseases studied in the lab.

"That might take a few more years and is dependent on funding," said Ametaj. "And after that, you have to develop a cow-side technology (so the farmers can do their own testing)."

The studies have been funded by Genome Alberta, ALMA, Alberta Milk and NSERC. ■



Surprise finding could help reduce calf mortality

Feeding cow calves immediately after birth enhances cow calves' gut bacteria in a way that could substantially reduce their mortality rate, new research suggests.

While collecting baseline data about the guts of newborn dairy calves, PhD student **Nilusha Malmuthuge** discovered that a complex community of bacteria colonizes the calf gut during the birthing process, growing in size from zero to millions mere minutes after calves are born.

She found that feeding calves their first milk promoted a probiotic bacterial group found in yogurt that staves off diarrhea while it decreased pathogenic *E. coli* bacteria.

"We used to think that feeding the calves is just for growth or helping the immune system," said Malmuthuge. "We never thought that we might be feeding the gut bacteria."

Improving the development and management of early gut microbiota could have significant impact on the cattle industry, which has a calf mortality rate of 10 per cent, half of which is caused by calf diarrhea.

Malmuthuge's next step is to study the first week of calf life and see how early gut microbiota influence the gut development and when the best window of time is to manipulate microbiota to improve calf health and development. ■



Amy Mayner BSc '12 BSc (Ag)

Amy is a cattle buyer with Cargill Meat Solutions. Constantly on the road—her territory spans eastern Alberta and western Saskatchewan—Amy attends cattle auction markets and visits an average of 20 producers a week.

When she's buying cattle in the ring, "I need to visually assess the quality of that animal and decide how much I want to pay for it, in a split second. Until you get a little practice, it's a bit challenging."

Although her plans were to go on to vet school after earning her degree, this job was too good to pass up.

"I'm very passionate about the beef industry and the success of it, and I've always enjoyed visiting with producers. This career allows me to further my knowledge of the cattle industry and utilize my communication skills," she said.

Amy, who was raised on a Bluffton cow-calf farm, was accepted into the Cattlemen's Young Leaders program after graduation, which allowed her to participate in a mentorship program and also attend industry events and develop networking skills.

She credits what she learned in various AFNS nutrition, physiology and production with helping her connect with producers and discuss issues they face on a regular basis. "I also took two meat production courses. I use what I learned in them on a daily basis while assessing live animals." ■

High-tech tools measure methane emissions of beef cattle

Lasers and a breathalyzer are allowing researchers to significantly reduce methane emissions from cattle.

John Basarab, an AFNS adjunct professor and Alberta Agriculture and Forestry researcher, and his team decided to take on the challenge of measuring methane emissions from cattle while they're in a pasture. They developed a laser beam tool they placed up- and downwind of the cattle to measure concentrations of methane in the atmosphere, and a breathalyzer within a feeder that measures continuous concentrations of methane and carbon dioxide while the animal is eating.

The new high-tech tools create "a quicker, non-invasive and less expensive

method for measuring methane emissions in cattle, under their near-normal production environment," said Basarab.

So far, the tools have revealed that breeding animals for lower residual feed intake may reduce methane emissions by 10 to 15 per cent over 15 to 25 years of selection.

While beef production accounts for only 3.6 per cent of Canada's GHG emissions, Basarab contends that consumers are calling for beef products with reduced carbon footprints and improved sustainability attributes. He added that mitigating practices by the beef industry could be used as carbon offsets by other sectors such as the energy industry. ■



Highlights





Capstone projects give graduating AFNS students a market edge

Solving real-life problems hones skills employers seek

As if graduating students aren't already stressed by job hunting, there's the prospect of the work itself. What will it be? What will the boss want? Is there a way to prepare?

Such anxieties are reduced for AFNS graduates as the department requires every student to complete a capstone project.

A capstone is a culminating assignment in which students working in teams solve a challenging practical problem in their field by drawing on everything they've studied to date. The project emphasizes critical thinking, and must have substantial scope. It also demands ethical and professional conduct from students, and includes oral and written communication.

For fourth-year Nutrition and Food Science majors **Rim Bzeih**, **Olivia Thompson** and **Cara McLean**, the goal of their capstone course was precisely what a professional position might demand: develop the prototype for an actual food product.

They created an exceptionally cheesy tasting, yet vegan, zucchini chip. It required umpteen slightly different iterations, testing not only their food technology skills but their perseverance and confidence.

“It was a bit scary at the beginning when we failed several times and we thought we weren’t going to be able to do it on time,” said Bzeih. “I learned that patience is something highly needed in my field and that group work makes better ideas and results.”

Paying heed to the many required non-technical steps—from quality inspection and hazard analysis, to marketing and scale-up—deepened the learning.

Thompson was promptly hired as a product development technologist for the Government of Alberta, and believes that the capstone course was instrumental in her landing the job.

Current associate dean for research **Anne Naeth** helped create the capstone guidelines for all ALES programs in the early 1990s when she held the position of associate dean (academic).

First, tackling problems through teamwork offers every student an opportunity to excel and much differently than by memorizing facts for an exam or writing a term paper. Shouldering responsibility for team positions helps them realize their full potential, said Naeth.

Capstones call on both technical and social skills, a combination sought after in applied science jobs.

“Most of the work we do is not a solitary science,” said Naeth. “So much of what we do is interdisciplinary. We have to work with people, and if we don’t work with them we have to deal with them, solving their problems.”

Indeed, some projects will catch the notice of more than potential employers.

This year, Animal Health Science students working under instructor **Paul Stothard** produced 12 research-supported, consumer-friendly posters on animal health care. They will be posted around the city by Edmonton’s Alberta Helping Animals Society, an organization that provides veterinary services to low income individuals, with a goal of preventing issues that can lead to veterinary bills.

Such outreach summarizes the value of capstones, said Stothard.

“Students make connections that can lead to employment, have the opportunity to develop their professional skills, and get a taste of the real world.” ■

◀ LEFT: Fourth-year Nutrition and Food Science majors Cara McLean and Rim Bzeih developed a prototype of a food product in their capstone course, just as they’ll be expected to do on the job market.

▶ RIGHT: Ruminant nutrition expert Michael Steele was awarded a prestigious NSERC Industrial Research Chair in Dairy Nutrition to develop a feeding and management program aimed at decreasing calves’ infection rate and antibiotic use while increasing their growth and productivity.



New industrial research chair to benefit dairy industry

Improving animal welfare and help reduce mortality, morbidity and antibiotic use in dairy calf production received an important and substantial boost recently.

AFNS ruminant nutrition expert Michael Steele was awarded an NSERC Industrial Research Chair in Dairy Nutrition with funding from Alberta Milk, Lallemand, the B.C. Dairy Association, SaskMilk, the Dairy Farmers of Manitoba and Westgen, last spring. It will provide Steele with secure research funding for the next five years.

His specific goal is to develop feeding and management practices for calf and ruminant production that will promote proper gut colonization and development, thereby decreasing susceptibility to enteric infection and antibiotic use, while increasing growth and future productivity.

The proposed research projects will provide a better understanding of how pre-weaning nutritional and management factors common in dairy production can impact gastrointestinal development during the pre-weaning phase.

It’s expected Steele’s research program will benefit the \$8 billion Canadian dairy industry by providing important information to dairy producers about the impacts that commonly used nutrition and management practices have on the growth, development and production of calves. ■

Novel food product earns students trip to international food showcase

Three Nutrition and Food Science students took to a major international stage last July, showcasing their ingenious recipe for a gelato made from pulses.

The team of **Austen Neil**, **Chandre Van De Merwe** and **Nicolle Mah** placed second at the national competition for Mission ImPULSEible in February, with a scrumptious yet nutritious treat called BiotaGelata. Made with fermented white beans and kidney beans as its milky base, it dazzles the taste buds in four different flavours—maple walnut, passion fruit, dark chocolate and cassia.

Only the first place winners were scheduled to get an all-expenses-paid trip to Chicago for the Institute of Food Technologists Annual Meeting and Food Expo to showcase their innovative food product, courtesy of the competition sponsor Pulse Canada as it marks the International Year of Pulses with this extra benefit for 2016.

But the judges were so impressed by the flavours, textures and novel concept behind the students' gelato that the provincial industry body, Alberta Pulse, decided to provide support for this team to attend, too.

"This is the students' chance to make contacts in the industry as well as potentially find a company or food processor who might be interested in their innovative pulse product," **Debra McLennan**, food and nutrition coordinator at Alberta Pulse.

Indeed, the event is one of the largest food expos in the world, where more than 20,000 attendees from the food industry can view and taste new products, including this unusual product—which is officially titled a "gelata" because gelatos contain real milk.

The University of Alberta students were intent on creating something that didn't just add pulses to existing food, but actually used them in a manner not tackled before, said Neil.

The team also took to heart the advice of **Lech Ozimek**, its academic advisor, who told them that sometimes the best idea

is to simply replace a singular ingredient and do it well.

They decided to replace regular milk with beans fermented for several hours as the gelato's base.

"The fermentation process worked to break down the volatile beany compounds and turned the bean milk into a liquid that tasted like yogurt," said Neil.

In addition to being packed with the nutrients of pulses (which include fibre and protein, high levels of iron, zinc and phosphorus, and B-vitamins such as folate) the gelato has the potential to appeal to a whole new customer segment—those seeking dairy-free foods.

It also met the challenge set for this year's competition, which was to create a delicious and healthy food product using pulses (whole dry peas, beans, lentils and chickpeas) that exhibits an innovation in traditional foods, in order to celebrate the International Year of Pulses.

Recently, ALES food science students have had a terrific track record with the Mission IMPULSEible competition that's now in its ninth year.

In 2014, a team from ALES won the \$2,500 national prize with Pulse Pops, a frozen treat consisting of chickpeas, peanut butter and soy nuts, wrapped with black bean and cacao and rolled in chocolate and coconut. In 2011, another nationally winning team from the faculty developed gluten-free pulse chips. ■

▼ BELOW: Alberta Pulse were so impressed with the gelato Nutrition and Food Science students Nicolle Mah, Chandre Van de Merwe and Austen Neil developed with pulses, the producer group funded the students' trip to showcase their product at an international food expo this July.



International learning experiences add educational value



▲ TOP: Fourth-year Nutrition student Moni Holowach and 20 other students learned about several other agricultural systems during their trip to Cuba.

▼ BELOW: Some of the 21 ALES students that went on the ALES community service-learning tour in Cuba earlier this year get busy on a local farm, knocking beans out of their pods.

AFNS students shared vivid snapshots of the wonders and worries of the world as they reflected on international study trips they took during the past year during an international experiences symposium.

“Canada’s way is not the only way,” said **Moni Holowach**, explaining new perspectives she gained during her ALES Reading Week trip to Cuba in February.

A fourth-year Nutrition student, Holowach toured various agricultural systems in Cuba, including a herbal medicine farm and an urban garden, and soaked up information on agronomy and ecology, sustainability and politics. With 20 other students, she also provided community service by hand-weeding and spoke to Cuban students from the University of Cienfuegos about economic and cultural changes expected when the American travel ban to Cuba is fully lifted.

Students, alumni and donors who listened to the travel-experience summaries were also told about the breadth of choices and time periods for international study that are possible for AFNS participants.

During an intensive three-week trip to Italy, third-year Nutrition students Anissa Armet and Joanne Alano explored health practices there by touring care centres and meeting such patients as a 107-year-old who’d just undergone a hip replacement.

Alternative Reading Week programs in India, Cuba and inner-city Edmonton and the Mexico Agribusiness Study Tour are co-curricular and take place in early and late spring, respectively. ■





Department enhances its focus on bioresource research and training

▲ TOP: John Wolodko is AFNS' new Alberta Innovates-Technology Futures Strategic Chair in Bio and Industrial Materials. He will help enhance the department's research and teaching in bioresources.

AFNS is fortifying its research and teaching in bioresources.

John Wolodko, a senior bioresources researcher, became the Alberta Innovates-Technology Futures Strategic Chair in Bio and Industrial Materials in ALES last October.

He will assist in creating stronger links between AFNS researchers and Alberta Innovates-Technology Futures, the arm of Alberta Innovates that helps develop and deliver new bioresource technologies in the province's agriculture, forestry, oil and gas, environment, health and pipeline sectors.

Bioresources are biologically based materials and processes that are sustainable and biodegradable. They can be used to create a variety of

products including fuels, solvents, high value chemicals, adhesives, construction materials, plastics and more.

AFNS researchers have already expanded the understanding of the science behind bio-based products and are engaging in applied research to create new technologies and solutions. Wolodko's appointment creates immense potential for more graduate training and research focused on an emerging area of demand from industry: bio-based goods made from materials using agriculture and forest products, said Ruurd Zijlstra, Chair of the Department of Agricultural, Food and Nutritional Science.

Wolodko's chair is a joint appointment between AFNS and the Faculty of ALES' Department of Renewable Resources. ■

Lipid Chemistry Group wins top Alberta science honours

AFNS researchers have won one of Alberta's highest science and technology honours.

The Lipid Chemistry Group won the 2015 Alberta Science and Technology Leadership Foundation (ASTech) Award for Outstanding Achievement in Applied Technology and Innovation for its development of bio-based chemicals.

Led by **Jonathan Curtis**, the group uses lipids to make bio-based chemicals. These vegetable-oil based polyols are the building blocks for a range of plastics and synthetic materials, including greener polyurethanes used for paints and varnishes, and for insulating foam.

Additionally, Curtis and his team are looking for crops other than canola to convert into bio-based materials, which could create new economic opportunities for local farmers.

"We're also working with camelina, which several companies are interested in establishing as a bigger crop," he said, referring to a flowering plant also known as false flax or wild flax. ■

▼ BELOW: Jonathan Curtis' Lipid Chemistry Group won the 2015 ASTech Outstanding Achievement in Applied Technology and Innovation Award for its development of bio-based chemicals which are transformed into a range of organic plastics and synthetic materials.



2015-16 Facts and Figures

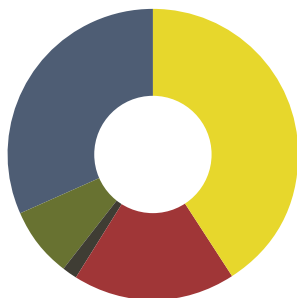


Partners and Funders 2015-16

Agriculture and Agri-Food Canada	BioLargo Water, Inc.	Heart and Stroke Foundation of Canada
Acadian Seaplants Ltd.	BioNeutra Inc.	Hieco Ltd – A subsidiary of May-Ruben Technologies
ADM Alliance Nutrition Inc.	Burnbrae Farms Ltd.	Hypor LP
Agriculture Funding Consortium includes:	Canada Foundation for Innovation	ICC Industrial Comércio Exportação e Importação Ltda
<ul style="list-style-type: none"> • Alberta Barley Commission • Alberta Canola Producers Commission • Alberta Chicken Producers • Alberta Crop Industry Development Fund • Alberta Innovates-Bio Solutions • Alberta Livestock Meat Agency Ltd • Alberta Milk • Alberta Pulse Growers Commission • Alberta Wheat Commission • Egg Farmers of Alberta • Western Grains Research Foundation • Alberta Agriculture and Forestry 	Canada Research Chairs	International Plant Nutrition Institute
	Canadian Biosystems, Inc.	Jerry W. King - Critical Fluid Symposia
	Canadian Charolais Association	Kellogg Company
	Canadian Dairy Network	Kaiser Foundation Research Institute
	Canadian Foundation for Dietetic Research	Kidney Foundation of Canada
	Canadian Institute of Health Research	Lallemand Animal Nutrition
	Canadian Poultry Research Council	Lilydale Inc. – A Sofina Foods Company
	Canadian Swine Research and Development Cluster	Maple Leaf Foods Inc.
	Canola Council Canada	Michael Foods, Inc.
	Ceapro Inc.	Mitacs Inc.
	Climate Change and Emission Management Coproration	National Centre of Excellence BioFuelNet Canada
	Consolidated Coating	National Pork Board
	Crop Production Services (Canada) Inc	National Research Council of Canada
	Dairy Farmers Canada	Natural Sciences and Engineering Research Council of Canada
	Danisco UK Ltd.	Olds College
	Danone Institute	PIC USA Inc.
	Diamond V Mills Inc.	Pioneer HiBred Production LP
	Dietitian of Canada	Saskatchewan Canola Development Commission
	DSM Nutritional Products	Saskatchewan Pulse Growers
	Ducks Unlimited Canada	Schlumberger Foundation
	Egg Farmers of Canada	Soy 20/20
	Egg Processing Innovations Cooperative	Syngenta Canada Inc.
	Engage Agro Corporation	Teagasc – Agriculture and Food Development Authority
	FMC of Canada	University of Calgary
	Forge Hydrocarbons Corporation	University of Guelph
	Genesis Inc.	University of Manitoba
	Genome Alberta	University - Dalhousie
	Genome Canada	University of Saskatchewan
	Genome Prairie	
	Healthy Cow Corporation	
Alberta Centre for Child, Family and Community Research		
Alberta Biodiversity Monitoring Institute		
Alberta Economic Development and Trade		
Alberta Enterprise and Advanced Education		
Alberta Hatching Egg Producers		
Alberta Health Services		
Alberta Innovates-Health Solutions		
Alberta Innovates-Technology Futures		
Alberta Oat Growers Commission		
Alberta Pork		
Alberta Turkey Producers		
Alberta Vista – A division of AB Agri. Ltd.		
Almased Wellness GmbH		
ATCO Electric Ltd.		
Bayer Crop Science Inc.		
Beefbooster Inc.		
Beef Cattle Research Council		

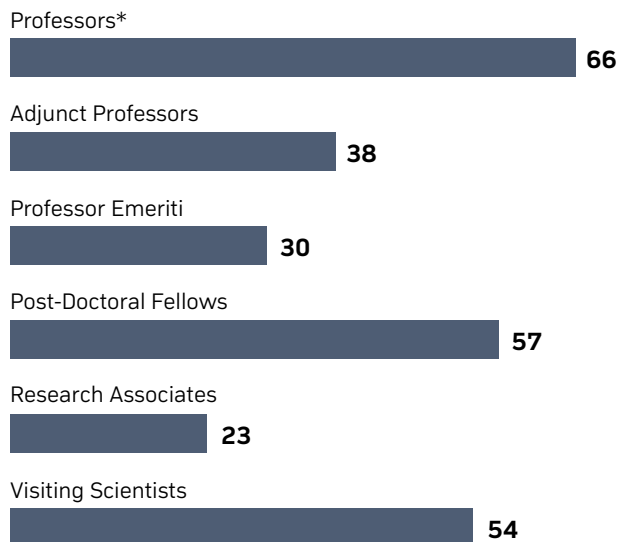
By the numbers

Research funding: **\$26,855,238**



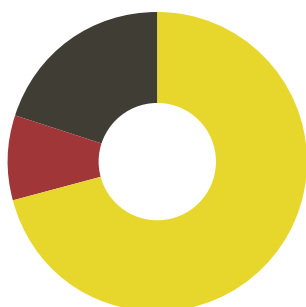
- **\$ 11,038,108** AB Provincial Government
- **\$ 4,847,371** Federal Government
- **\$ 377,254** Other Government
- **\$ 2,158,684** Industry
- **\$ 8,433,820** Other

Academic staff

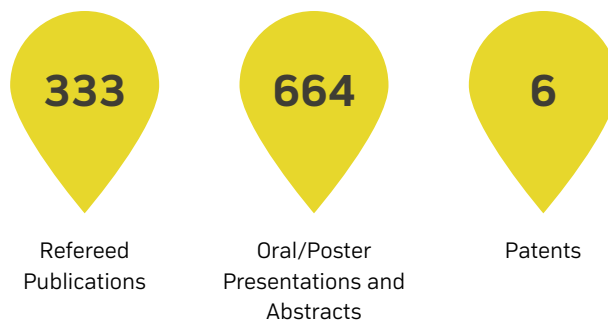


* Includes AAFC and ARD academic work affiliates/cross and joint appointments.

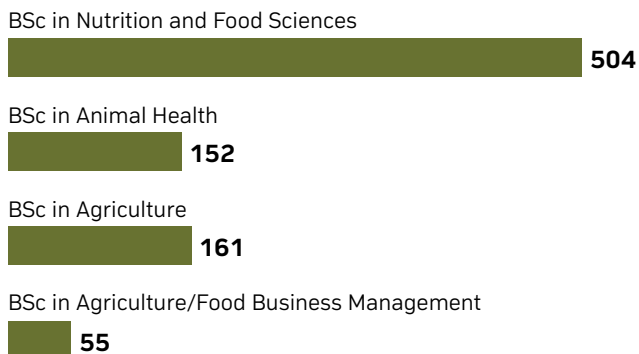
Operating funding: **\$13,805,291**



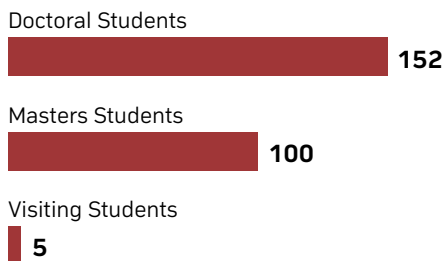
- **71%** Academic, Administrative and Teaching Support
- **9%** Central Laboratories
- **20%** Research Stations



Undergraduate student enrollment



Graduate student enrollment



New Graduate Students in 2015-16



Graduate Students Convocated in 2015-16

Technology transfer

- 5** Exclusive and Non-exclusive Licences
- 2** Exclusive Options
- 11** Technologies with Patent Protection Initiated
- 39** Technologies that received Investment by TEC Edmonton, Inventors, etc.
- 18** Material Transfer Agreements

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
- Land W McElroy Metabolism & Environment Research Unit
- Swine Research and Technology Centre
- Enclosed Composting Facility
- Feedmill
- Ministik Field Station
- Roy Berg Kinsella Research Ranch
- St-Albert Research Station
- Mattheis Research Station



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