



**Poultry
Research
Centre**

2013 Annual Report

April 1, 2013 to March 31, 2014



Vision

**Excellence in research and learning
through partnerships with the entire value chain
to advance the development
of value-added poultry products and production practices**

Goals

To conduct excellent research
that leads to the development of innovative and sustainable production systems

To serve as a leading source of scientific knowledge
that supports the production of safe, high quality poultry products that
meet changing consumer needs

To foster an environment of learning
that incorporates input from industry, as well as teaching, technology transfer and
knowledge transfer activities

To connect with industry
in a continuous manner, both in the receiving of input and the transferring of knowledge

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Chair's Report

Submitted by Helen Anne Hudson

The Poultry Research Centre has had another year with many accomplishments. Such a great partnership which includes all the necessary players in poultry research! The partnership is well represented by the advisory board members from a wide cross section of industry and government. This brings a broad perspective to the Centre. The poultry industry is multi-faceted unlike other livestock industries. It encompasses chickens, both meat and egg types, turkeys and the breeder industries that supply them. These are connected to the hatching industries. So we have much more to consider when funding research. Fortunately, what benefits some commodities benefits others. Thus research in the hatching egg industry (mostly broiler eggs) benefits the broiler and broiler breeder industries and vice versa.

The Poultry Research Centre is also multi-faceted in that it brings together in a collaborative fashion, researchers studying poultry and poultry products. Research that leads to innovative feeding, management or products from poultry is critical for dealing with such issues as environmental impacts of our industry, adding value to by-products, and adapting to social and multi-cultural swings.

It goes without saying that the Poultry Research Centre attracts an impressive array of graduate students. They win more than their share of awards and add to the excellent research done here at the PRC. They also participate in industry meetings and other functions thus networking well with the poultry industry. Similarly, the undergraduate students, through the Poultry Club and the Animal Science Capstone Course, network with industry and get great hands on experience with poultry. All of these types of activities serve well to attract students to our industry and find them employment when they graduate.

With a tough year behind us of activist undercover work on animal agriculture, our industry is feeling the pinch. It is amazing that so much misinformation could be released in such a short period of time. At the same time we have realized cuts to our industry in welfare research capacity from AAFC. This has greatly affected all research in animal welfare. It is hard to believe that this could all happen at the same time. At the Poultry Research Centre resources have held fast. There have been great successes with some innovative projects such as the Precision Broiler Breeder Feeding system and the Heritage Chicken Program which could well serve as a model for other organizations and universities raising these birds. There will be new commercialization opportunities for products from the value-added group. There has been collaboration with the Poultry Health sector and directly with industry to help problem solve such as the Managing Mediums and the Turkey Quality and Welfare Projects. The poultry industry should work towards promoting and protecting the quality resources remaining in poultry

science. They will be needed to help feed a growing global population more food with more efficient use of resources.

Academic Leader's Report

Submitted by Martin Zuidhof

Once again we have come to the end of a productive year. I'm very encouraged with how things have evolved at the PRC this year. With an eye on developing a strategic framework, we worked hard to understand where the PRC has come from and what exactly we are. We are NOT just a university "Centre". That's part of it, but more importantly, we are a coalition of industry, government and university, working together where we have a collective "sweet spot". Our challenge in the coming year will be to increase our understanding of this coalition so that we can operate effectively, for the mutual benefit of all partners. The bottom line for success is engagement. Technically, no one "reports to" anyone in the PRC structure. The coalition works because of a common will to move toward a shared vision. We will continue to define what it is that each individual (you and I) and their respective organizations need from the PRC, and what you and I must "bring to the table" for the PRC to make a positive impact for all of its stakeholders (you and me).

I am grateful to work with excellent people. At our fall Advisory Board retreat, I observed a marked shift in language from an "us and them" system of thinking toward a more truly collaborative model. Since then, we have made similar progress with "internal" (though we are trying not to use that word) operational personnel, or providers of our education, research, and technology transfer mandate. We will continue to work at defining a value proposition for each stakeholder – farmers, processors, tech service personnel, agencies, veterinarians, researchers, technicians, and students. By recognizing the uniqueness of what every party brings to the table, and the demands and the reward systems that each individual works under in their own organizations, we are already moving toward a more respectful and appreciative climate. Frankly, the PRC thrives by exploiting and rewarding people in every one of our partnering institutions. The better and fairer the balance between reward and requests, the greater the impact the PRC will have.

We have thrived again for another year in all areas of our mandate – research, technology transfer, and education. In research, we have had exciting and productive local, national and international collaborations. This year we made progress in over 35 active projects on topics in the fields of Food Safety, Production Systems, Nutrition and Physiology, and Meat and Egg Processing and products. Development of precision feeding technology has put the PRC on the leading edge of production research data acquisition, and may transform the level of efficiency of hatching egg production once commercialized. Egg peptide commercialization continued to be a strong focus, with potential new partners identified.

We have had continued success in teaching and education. We supervised 38 students on poultry related projects, saw 5 MSc students and 1 PhD student graduate, and earned still more teaching awards. Over 20 undergraduate students were immersed in extracurricular poultry activities through the PRC student club. These young people are passionate about pursuing experiential learning activities related to poultry, and many will be the future leaders of the poultry industry.

Our “Adopt a Heritage Hen” program transformed our ability to sustainably maintain valuable populations of antique and commercial benchmark genetic lines. With tremendous support from the general public, we were able to raise over \$75,000, which at least in the short term ensures the survival of our heritage lines.

Once again, as academic leader of the Poultry Research Centre, I’m very proud and excited to encourage you to read about our achievements and to think about how our knowledge can contribute to your success. Thanks for your support and engagement!

Technology Transfer Highlights

Submitted by Val Carney

Working together to address industry issues

In 2013, PRC researchers, extension specialists and industry partners worked together to develop strategies to address industry issues. Below are highlights of the Research Adoption and Technology Transfer activities.

Managing Mediums: A workshop on egg size

2013 was a busy year of visiting farms and working with producers for the medium egg project. In October, a series of workshops were presented across Alberta. The workshops emphasized the importance of paying attention to pullet nutrition and growth, forming consistent management habits, on-farm feedmill management, and a top ten list of egg size management tips. The workshops were very well received, with 100% of attendees indicating that they would attend a similar workshop in the future. 88% of attendees reported that they would be implementing new practices on their farm as a result of attending the workshop.

Turkey Quality and Welfare

Working together with the Alberta Turkey Producers and Poultry Health Services, PRC researchers investigated factors associated with high incidences of *Airsacculitis*, downgrades in heavy turkey toms at processing as well as dead birds on arrival. Findings from the project were summarized in report provided to the Alberta Turkey Producers and presented at the producer meeting in October. This project has provided directions for the industry to explore in their continuous improvement journey. The PRC team are pleased to have worked closely with its partners to address the challenges facing the industry.

Popular poster presentations

Poster presentations provide a great opportunity for all members of the PRC to interact and discuss the exciting research conducted to harness new opportunities and grow in knowledge. Research at the PRC spans the continuum from production to consumer and from basic to applied. Poster presentations enabled researchers and students to share what we learned through research and to learn how it can affect change. Back by popular demand, the PRC was well-represented at the 2013 Alberta Poultry Industry Annual General Meetings in Red Deer with twelve poster presentations from researchers, graduate students and the University of Alberta poultry club. In May, the PRC hosted nearly 100 industry partners and supporters at the “Evening of Learning and Sharing” held in conjunction with the PRC Annual General Meeting. Input, feedback and interaction with our partners and collaborators has helped shape our research and programs to be targeted, relevant and applicable.

Website redesign

The PRC website has been redesigned! The new website allows visitors to find out the latest news about the PRC. The new address is www.poultry.ales.ualberta.ca.

Highlights: Education, Training & Retention of Highly Qualified People

Submitted by Doug Korver

Leadership in teaching

PRC team members are an important part of the graduate and undergraduate teaching program at the University of Alberta. In 2013, there were again 2 undergraduate classes focused entirely on poultry: Poultry Nutrition (ANSC 463) and Applied Poultry Science (ANSC 471). Enrollment in these classes was 19 and 21 students, respectively. In addition, there were 8 students involved in 2 poultry-specific projects (ventilation in broiler breeder barns, increasing visibility and consumer awareness of the heritage egg program at the University of Alberta, and another 7 students in 2 groups working on projects with some relevance to the Poultry Industry (agriculture education for urban youth, increasing effectiveness of Alberta Farm Animal Care) in the Animal Science Capstone Course (ANSC 479). Students involved in this course work with a mentor on an industry-relevant problem, and report their findings back to the industry stakeholders. PRC team members also teach an additional 8 courses with at least some relevance to poultry, with over 540 students at the undergraduate level. At the graduate level, our faculty teach 4 graduate courses, to 18 students, with poultry content in the courses ranging from 5% in one of the classes to 100% in 3 of the classes.

Dr. Tom Inglis is an Adjunct Assistant Professor at the University of Calgary Faculty of Veterinary Medicine, teaching veterinary students at UCMV about Poultry health and diseases. In addition Dr. Doug Korver gives an annual 3-hour lecture to UCMV students on poultry nutrition and feeding.

Dr. Clover Bench was awarded an ALES Teacher of the Year Award, as well as the 4H Alberta Leadership Recognition Award. Dr. Martin Zuidhof received an ALES Teacher of the Year Award, the Provost's Award for Early Achievement of Excellence in undergraduate Teaching, as well as a spot on the ALES Teaching Wall of Fame. Congratulations Clover and Martin!

Training of HQP

In addition to the technicians, Research Associates, Post-doctoral Fellows, Undergraduate Research assistants and Visiting Scientists (see elsewhere in this report), the PRC team continues to recruit and train excellent graduate students. In 2013, over 40 graduate students and 5 undergraduates were trained at the PRC. Our students are very competitive for scholarships and awards locally and internationally. Our group includes 17 technicians and research assistants, 8 post-doctoral fellows, and 6 research associates, each of which makes important contributions to the PRC's research mandate.

Recruitment

The Poultry Research Centre Student Club (PRCSC) continues to be active, with 20-40 members participating this past year. The number of students has decreased somewhat from last year, largely because of the success of PRCSC students in gaining admission to veterinary programs and graduating. However, this year's club is active, and already planning events for next year. Fundraising activities have

been conducted and grant applications developed to allow the PRCSC to take a field trip to visit poultry facilities in Southern Alberta, and also possibly to attend an industry conference.

PRCSC members have taken the animal handling training, and have been ready and willing participants in data collection during poultry research projects conducted at the PRC. The PRCSC has been a valuable addition to the PRC family, and we look forward to cultivating an interest in poultry science and poultry production in as many students as possible.

Integration with industry

The PRC was well-represented at the 2014 Alberta poultry industry Regional Meetings in Red Deer. Five PRC members, 3 technical staff and 6 graduate students attended. Research posters were displayed and producer meeting presentations were given by the PRC team. PRC members regularly attend provincial regional producer meetings, and contribute to the organization of industry conferences such as the Poultry Service Industry Workshop. The PRC and the Poultry Club are working to further industry relationships through poultry industry internships.

Business Development Highlights

Submitted by Agnes Kulinski

The Business Development at the PRC continues to be an exciting area with many opportunities. We have been successful at generating new revenue streams to build the sustainability and self-sufficiency of the PRC. Over the past year, I have worked on two opportunities - the Heritage Chicken Project and commercialization of egg peptides.

The Heritage Chicken Project:

The Adopt a Heritage Chicken Program has been a very successful program to support genetic preservation. In a short time the PRC has developed a niche market for heritage eggs and meat. We raised over \$15,000 in March 2013 for the pilot study, and \$60,000 in November 2013. The sale of eggs and meat generates financial benefits to the PRC for maintenance of heritage breeds and support poultry research. The Heritage Chicken Program has attracted interest from many farms and businesses. For example, we have collaborated with local businesses to create products featuring heritage chickens. Furthermore, we have been approached by local farms that are interested in raising heritage chickens or to help them with the development of a new outdoor poultry breed with improved immunity and hardiness. Some of these interests could turn into collaborations and possible revenues streams.

Commercialization of egg peptides:

Another project I was involved in is the commercialization of peptides isolated from eggs. The commercialization of egg peptides is a great opportunity for Dr. Jianping Wu and the PRC. Dr. Wu has developed simple methods of preparation of three egg proteins: phosvitin, ovomucin, and ovotransferrin. The plan is to develop a natural health product containing these peptides in the areas of bone health, cognitive health, and cardiovascular health. We have identified a possible partner to commercialize these technologies – a local company, Afinity Life Sciences. With the financial help from ALMA we will perform feasibility studies and establish a business plan to commercialize these egg peptides.

Stakeholder Reports

Agriculture and Rural Development – Government of Alberta

Submitted by Wesley Johnson

Salutations from Alberta Agriculture and Rural Development, as we move from 2013 and forward into 2014 the Livestock Research Branch (home base Edmonton-JG-O bld.) which has been the primary historical link to the PRC and is now part of the redefined Livestock and Extension Division. This Division has three other Branches: Traceability (home base Edmonton-JG-O bld.), Alberta Ag-Info Centre (home base Stettler) Livestock and Farm Business Branch (home base Olds), and our Executive Director is John Brown. We are part of the Industry and Rural Development Sector which has four other Divisions, reporting to Assistant Deputy Minister Jo-Ann Hall. ARD has two other sectors: Food Safety and Technology; Policy and Environment; all three sectors report to Jason Krips who is the Deputy Minister and started in fall of 2013. ARD is defining its overall mandate in terms of four areas: Maximizing Value; Market Access; Social License; and Rural Development.

The Livestock Research Branch has been engaged and supported the PRC in a variety of endeavours through planning and developing key PRC extension activities, materials and events. Working with the poultry industry the technology transfer team has organized and delivered three Medium Egg Workshops (in Edmonton, Calgary and Lethbridge), participated in field research and developed extension materials to address challenges in the turkey industry, assisted the Alberta Chicken Producers with their Research symposium and supported the Poultry AGM's in the winter at Red Deer. Within the Monogastric research team, there has been a wide range of work and some of the presentations and papers developed are: "Evaluation of *Camelina sativa* as a feedstuff for layers: Effects of increasing dietary inclusion and layer strain on feed intake, egg production, and physical egg quality"; and canola feed trial- "Solvent-extracted vs. extruded-expeller-pressed *B. napus* and *B. juncea* fed to layers: Effects on feed intake, egg production, and physical egg quality", along with "A comparison of *B. napus* and *B. juncea* meals and their air-classified fractions: Growth performance, carcass traits, and measured AME in growing broilers". The Branch staff has also been part of the PRC strategic planning focus group sessions and supported operational activities of poultry unit at U of A.

The partnership between the Livestock Research Branch and the Poultry Research Centre is indispensable in fulfilling the core strategies to accelerate the adoption and commercialization of scientific knowledge and research outcomes and to cultivate collaborative research partnerships to identify and solve major industry challenges. In taking the lead on technology transfer for the centre, the Livestock Research Branch has developed strong industry connections through its delivery of relevant and applicable research solutions.

Alberta Chicken Producers

Submitted by Karen Kirkwood

Alberta Chicken Producers Shared Industry Vision:

To continue to grow, be profitable, and satisfy consumers by providing safe, high quality chicken products.

Alberta Chicken Producers is a major partner in the Poultry Research Centre (PRC); and, has been engaged in this partnership from the PRC's establishment in 1986. Our industry has cultivated a close working relationship and promotes open communication with the PRC to ensure its research and development themes are aligned with the priorities of Alberta's poultry industry. This level of integration between researchers, industry and producers is a unique and innovative model that continues to meet the dynamic needs of our industry.

We are proud of the accomplishments of Alberta's chicken industry, which have been supported by our partnership with the Poultry Research Centre:

- Successful delivery of Alberta Chicken Producers 2014 Symposium: *Antimicrobial Use in the Poultry Supply Chain*
- Certification of all registered chicken producers in Alberta under the mandatory Animal Care Program;
- Completion of an Ammonia and Humidity Baseline Study in Alberta's broiler barns to enhance the delivery of the Animal Care Program;
- Delivery of best practices for producers to support the mandatory *On-Farm Food Safety Assurance Program*; and
- Establishment of a Broiler Chick Quality Committee to advance broiler chick quality and brooding practices.

Alberta Chicken Producers appreciates the collaboration with the PRC researchers in focusing research projects to address our industry's priorities of:

Use of Antibiotics and Alternative Strategies

1. Animal Welfare
2. Food Safety
3. Uniformity and quality of live birds and product
4. Product and Resource Utilization

As our industry continues to assume a leadership role in addressing, our partnership and collaboration with the PRC is a key component of our ongoing leadership to address Antimicrobial Use (AMU), animal care and food safety; and, we look forward to a successful year ahead for Alberta's chicken industry.

Alberta Turkey Producers

Submitted by Cara Dary

Alberta Turkey Producers is the voice of the turkey production industry in Alberta. Our leadership and service contribute to creating a stable environment for the protection and growth of the Alberta turkey industry.

Our vision is a strong, stable and growing turkey industry committed to constantly improving product quality and building consumer confidence. Throughout 2013, the Alberta Turkey Producers implemented initiatives and worked on activities that were directly in-line with our vision.

In 2013, the Alberta Turkey Producers (ATP) completed its regulatory review, a process that occurs every five years in which ATP's provincial regulations are reviewed and amended as necessary. An amendment made in 2013 included the mandatory implementation of the Turkey Farmers of Canada's On-Farm Food Safety Program. Certification on the program was linked to annual licenses for all registered Alberta producers. ATP is pleased to announce that effective January, 2014 all registered producers have implemented the program on-farm and have received certification on the program.

Throughout 2013, ATP worked closely with the PRC on a research project titled Developing Strategies for the Alberta Turkey Industry to Improve Turkey Welfare and Quality. This project was initiated by the low percentage of Alberta heavy turkey toms achieving Grade A pricing. It was recognized that an opportunity for improvement existed. As such, ATP partnered with the PRC, the Government of Alberta, Lilydale and Poultry Health Services to conduct an on-farm and in-plant research trial with funding provided from the Growing Forward Livestock Welfare Grant administered by Alberta Agriculture. Many valuable lessons on poult quality, stocking density, air quality and transportation were learned from the research trial.

Through past and current work with the PRC, ATP and the PRC have developed a close working relationship. The PRC has provided ATP with the timely opportunity to access research expertise and collaborate with industry on very short timelines as was the case with the 2013 research trial.

ATP continues to value the collaboration between industry and research and continues to value the investment in students.

Burnbrae Farms

Submitted by Helen Anne Hudson

In the egg industry, housing for layers is one of our most important areas of concern. Several provinces have or will be making claims with respect to housing. The new Codes of Practice will contain new, scientifically backed requirements surrounding housing. Other issues in our industry are more ongoing such as bone quality, disease and production.

Extensive research is being conducted on newer (or older but new) housing systems for laying hens. Enriched cage, aviary and free run systems require more information on density, furniture (perches, nest areas) and lighting. Aviaries are relatively new systems which require much more research. Husbandry is a huge part of these new systems. The TV W5 episode which aired in October 2013 generated negative press for our industry. This event underpins the need to support research in animal husbandry, care, handling, transport and even proper feeding regimes and to educate consumers about agriculture. Many of these disciplines now fall under the “Welfare” program of study. Can other programs of research incorporate animal husbandry into their projects? Animal husbandry in our industry is being lost in the sea of technology that has developed. Research and study programs should be sure to include animal husbandry training. Good animal husbandry and health are key to consumer confidence (and our social licence to produce our products).

This past year I was happy to attend the PRC AGM and Fall retreat as a board member and representing Burnbrae Farms, a partner in the Centre. The PRC has an exceptional team of scientists and support staff which are effectively collaborating to produce excellent research for our industry. The opportunity to engage with this group is always a pleasure. The Evening of Sharing and Learning prior to the AGM is a great venue to learn about the research conducted at the university and to meet the students helping to conduct it. I have been involved with the heritage chicken project also which is a great project, realizing unprecedented success. It is a model for institutions across the country which harbour lines of heritage birds.

At Burnbrae Farms, we recognize the value of research and education to our industry. We are proud to support the PRC. They do excellent research for our industry. They educate, train and graduate high calibre (HQP) people to work in our industry. They provide professional support and problem solving for our industry. Sustainability of our industry depends on the sustainability of the research centres supporting it.

Egg Farmers of Alberta

Submitted by Jenna Griffin

Being part of the PRC is a great way to ensure constant communication between industry and researchers regarding both overall research and development needs as well as specific challenges and opportunities. The PRC supports the egg industry with scientific input on production issues that we can take directly to our producers. Furthermore, the PRC provides us with timely access to experts when unique challenges arise. The PRC also acts as a separate and objective voice for the industry on issues related to food safety and animal care which is extremely valuable in times of opposition to the use of scientifically validated practices. In addition, by working together, we have an opportunity to derive economic value from the application of technologies that can broaden our markets and result in more efficient use of byproducts.

Whether we like it or not, the W5 story about the Canadian egg industry, which featured a video recorded by an undercover investigator for Mercy For Animals Canada at an egg farm in Alberta, will stand out as a key event of 2013. We have known for some time that to build public trust the egg industry needs to ensure that what happens on our farms is aligned with the expectations and values of all stakeholders, including the public. What has become abundantly clearer over the past year is that we need to be more effective in communicating all of the efforts of our farmers and our industry. We dedicate ourselves to trying to improve our industry, from food safety, to the care of our birds, to economic stability. In addition to the previously planned changes coming to our animal care program, the unanticipated changes, and the implementation of our hen housing policy, in the coming year EFA will be working to develop a sustainability strategy that will help target our communication efforts to demonstrate the diligence of our organization and a commitment to achieving improvements.

Egg Farmers of Canada

Submitted by Julie Paillat

Egg Farmers of Canada's increased engagement with the Poultry Research Centre this year contributed to our ability to increase awareness of research activities and capabilities, develop new research endeavors, and further circulate PRC research results, knowledge, and innovations into the hands of the egg industry. The PRC contributes to egg farmers' ability to make science-based decisions, continuously improve best management practices, and discover new opportunities to grow and innovate throughout the supply chain. The PRC brings together people who can together identify industry needs, leverage available resources, and make solutions happen. We look forward to continued collaboration with its experts and students, poultry industry representatives and government authorities in 2014!

In 2013 Egg Farmers of Canada achieved a 3% increase in retail sales while finding further efficiencies for the Industrial Products Program. This year EFC initiatives have been markedly more proactive in demonstrating the value of supply management in efforts to maintain our government support and social license. A new strategic plan for research was developed and approved by the Egg Farmers of Canada which will drive progress in governance and organizational excellence, advancing discovery and critical knowledge, and knowledge mobilization and research adoption.

The system of supply management continues to receive increased attention in media, trade negotiations, and political debates. Because of the cooperation and hard work of our entire industry, such challenges have been responded to with an unprecedented level of approachability, responsive action, and accountability to the public, the egg supply chain, and other stakeholders.

Maple Leaf Foods

Submitted by Reg Cliche

The University of Alberta's Poultry Research Centre provides expertise and credible, science-based research that is helping organizations throughout the poultry supply chain bring to life important improvements in production methods, animal welfare, biosecurity and disease control. PRC also maintains a strong focus on innovation and assisting industry to create new offerings for the marketplace.

Maple Leaf Foods has a long standing and valued relationship with the Poultry Research Centre and we look forward to working closely with them to continually improve poultry operations within Maple Leaf and for the poultry industry overall.

Sofina Foods Inc.

Submitted by Sunny Mak

Continuous improvement is critical to ensure today performance and future success. New understanding of knowledge with research is one of the key factors to drive continuous improvement. 2013 is a rewarding year for Poultry Research center (PRC), many researches are done in a practical and scientific manner that add value to poultry industry. Many projects have direct and indirect contribution to our industry, just to name couple such as “Nutrition’s role in broiler health” and “Precision Broiler Breeding Feeding”.

As a member of the Advisory Board, I look forwards in 2014 to see the continual success of PRC, building a culture that is innovative with practical application to the poultry industry.

University of Alberta

Submitted by Erasmus Okine

As Chair of the Department of Agricultural, Food and Nutritional Science (AFNS), I am glad to contribute to the Annual Report of the Poultry Research Centre. Without hesitation, we can assert that there are many areas of success for AFNS and the PRC and its partners.

The PRC is an important Centre for the University because it connects the University to the broader communities and partners including the various segments of the Poultry industry and customers. We are indeed, honored to have a world class Centre, whose accomplishments will over time, be felt all across the world. Indeed, our partnerships with the poultry industries and our funders have helped to keep our research focused, relevant and applicable and thus have helped us to contribute to the economic, social, and environmental sustainability of the industry. In addition, these partnerships have helped to link our students to jobs/careers in fields that they have been trained for.

The PRC is also important to us because it is the Centre which provides solutions to the poultry industry. Indeed, some of the outstanding contributions to the poultry industry include:

- Precision Feeding System (innovative technology with the potential to revolutionize broiler breeder feeding around the world)
- Innovative uses of poultry by-products that range from filtration of arsenic from water (Ullah) to construction grade glues (Wu)
- Adopt a Heritage Hen

With the strong support from our partners and funders, we wish to extend our heartfelt appreciation to each member of the PRC for making the PRC a place for innovation. I know that with such support, we will continue to make the research program at PRC the envy of the world.

Awards

Congratulations to our hard working faculty and students who have earned recognition for excellence in teaching and research.

Faculty Awards

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| 1. | Clover Bench | ALES /ALES Teacher of the Year |
| | Clover Bench | 4H Alberta Leadership Recognition |
| | Martin Zuidhof | Provost's Award for Early Achievement of Excellence in Undergraduate Teaching |
| | Martin Zuidhof | AFNS Teacher of the Year Award |
| | Martin Zuidhof | ALES Teaching Wall of Fame |

Graduate Student Awards

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| 1. | Ali Akbari | (Wu) 2013 AFNS Winter Differential Award |
| | Nandika Bandara | (Wu) Alberta Innovates Technology Futures Doctoral Scholarship |
| | Nandika Bandara | (Wu) Macgregor Smith Graduate Scholarship for Agricultural and Food Engineering |
| | Nandika Bandara | (Wu) Elizabeth Russel MacEachran Graduate Scholarship for Food Science |
| | Nandika Bandara | (Wu) Donald A Shaw Memorial Graduate Scholarship for Bio-resource Technology |
| | Nandika Bandara | (Wu) 1 st place award in Graduate student poster competition PRC AGM |
| | Nandika Bandara | (Wu) AFNS Graduate Research Assistantship Fund tuition award |
| | Abiodun Bello | (Korver) 2013 AFNS Tuition Award |
| | Airell DesLauriers | (Zuidhof) North American Colleges and Teachers of Agriculture Graduate Student Teaching Award |
| | Yussef O. Esparza | (Wu) Becas Chile Scholarship |
| | Teryn Gilmet | (Bench/Zuidhof) 2013 AFNS Tuition Award |
| | Qiyi Li | (Wu) 2nd Place winner of poster competition PRC AGM |
| | Zheng Li | (Wu) Receipt of China Scholarship Council |
| | Carlos Lozanos | (Zuidhof) Poultry Science Industry 2013 Student Scholarship |
| | Carlos Lozanos | (Zuidhof) Lloyd Johnston Graduate Scholarship on Poultry Science |
| | Carlos Lozanos | (Zuidhof) Don and Mary Copeland Graduate Travel Prize |
| | Kausatv Majumder | (Wu) Mary Louise Imrie graduate student award; Faculty of Graduate Studies and Research, U of A |
| | Kausatv Majumder | (Wu) 2nd Place winner of poster competition PRC AGM |
| | Chamila Nimalaratne | (Wu) AFNS Graduate Research Assistantship Fund Tuition Award |

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| KoonPhol Pongmanee | (Korver) Thailand Government Scholarship |
| Suraksha Rajagopal | (McMullen) Fischer Science Graduate Scholarship |
| Jiandong Ren | (Wu) 2013 AFNS Winter Differential Award |
| Katherine Satchwell | (McMullen) Queen Elizabeth II Master's Scholarship |
| Juan You | (Wu) 2nd place of International Division in IFT-2013 George Stewart Graduate Paper Competition |
| Juan You | (Wu) Receipt of China Scholarship Council |
| Dan Zhang | (Betti) 2013 AFNS Tuition Award |
| Wujun Zhao | (Ullah) 2013 AFNS Tuition Award |

Graduations

Congratulations to the following students who earned their degrees in the current year 2013-2014.

| Graduate | Supervisor | Degree | Topic |
|--------------------------|--------------|--------|---|
| 1. Mohannad Badawi | Betti | MSc | High pressure processing of gelatin. |
| 2. Sahar Navidghasemizad | Wu | PhD | Improved approaches to separate high-value phospholipids from egg yolk. |
| 3. Dulal Paul | Zuidhof | MSc | Broiler breeder management. |
| 4. Kim Ton | Zuidhof | MSc | Antibiotic free broiler production. |
| 5. Henan Wang | Wu and Betti | MSc | Extraction of spent hen proteins for adhesive application. |
| 6. James Zhang | McMullen | MSc | |

Research Highlights

Research Impact:

*Beneficial application of research to achieve
social, economic, environmental and/or cultural outcomes*

Clover Bench

Dr. Bench leads the Applied Ethology Research Group in the Department of Agricultural, Food and Nutritional Science at the University of Alberta. Dr Bench's livestock behaviour and welfare research is highly collaborative in nature and works with a variety of livestock species on topics such as housing design, behaviour biometrics for stress and disease, and science-based welfare standards. Her poultry research at the PRC focuses specifically on the use of behaviour information to increase welfare and production efficiencies in various poultry systems in collaboration with poultry nutritionists, engineers, veterinarians, biologists, processors, and producers. As such, Dr Bench is often involved in a variety of poultry projects at the PRC lending her expertise in behaviour and welfare.

Dr Bench co-supervises a Masters student (Teryn Gilmet) with Dr. Zuidhof on the behaviour of broiler breeders fed using a novel precision system. She also teaches courses in Animal Welfare and Food Animal Behaviour, in addition to numerous guest lectures in the Agriculture and Animal Health programs.

Each year, Dr Bench attends the PRC AGM to talk about current poultry ethology research and attends poultry industry AGMs in Alberta. She often presents posters at each of these events as well as at the Alberta Farm Animal Care Livestock Care Conference on behaviour and welfare topics of importance to producers. Dr Bench and her research group regularly write industry newsletter articles on poultry behaviour and welfare topics and engage with the poultry industry as part of AFAC.

Eduardo Beltranena

Through his work at the Government of Alberta's Agriculture and Rural Development, Dr. Beltranena contributes publication, abstracts, posters and reports in the area of poultry research. He collaborates with Dr. Mirko Betti, Dr. Doug Korver and Dr. Wendy Wismer. He participates in Sandeep Nain's PhD Candidacy Committee.

ARD has contributed to the PRC's facilities with an \$10,000 upgrade to laying hen cage and through user fees associated with research projects conducted at the PRC. Dr. Beltranena has also been involved in the strategic planning discussions regarding future opportunities for the PRC.

Mirko Betti

Dr. Betti runs a research program with a focus on sustainability and health while maximizing the value of poultry meat processing by products. This is a focus with the potential to bring together both the

theoretical and the applied research. The Poultry meat processing industries generate a tremendous amount of by-products in which bioactive substances and valuable proteins and lipids can be recovered. Dr. Betti devotes most of his attention in the areas of

- Developing sustainable processes for extraction, isolation and purification of bioactive molecules (glycosaminoglycans, peptides) and functional proteins (i.e. myofibrillar proteins, sarcoplasmic proteins and collagen) from meat and fish processing by-products.
- Developing new approaches to increase the bioactivity and the functionality of the recovered protein and peptides through physical, chemical and enzymatic treatments.
- Understanding the chemistry involved in such modifications and how this relates to the final properties of our modified molecules.

Several research grants from funding agencies (i.e. Alberta Livestock Meat Agency, Alberta Innovates Bio-solution, Alberta Chicken producers, Alberta Turkey Producers) and Industries (Tessenderlo Chemie, Maple Leaf Foods, RossDown Natural farms) were obtained and enabled Dr. Betti to build the core of this research program.

Val Carney

Through her work with Alberta Agriculture, Val and her team have worked closely with the PRC to support research adoption in the Alberta poultry industry. Research in the field, hands on training and interaction with industry partners has facilitated the delivery of research solutions to Alberta specific opportunities. Through its funding, technical support and engagement Alberta Agriculture is committed to the continued success of the Poultry Research Centre.

Doug Korver

In 2013, Dr. Korver was an active and engaged member of the PRC. Most importantly, he conducted a large amount of research in the PRC facilities, and was involved with the Poultry Research Centre Student Club. He was active in the PRC strategic planning exercises. In his role as Chair and member of the Animal Care and Use Committee: Livestock, Dr. Korver is able to keep his fellow PRC researchers abreast of changes and items of interest taking place with animal care requirements at the University of Alberta. Dr. Korver was an academic mentor to two PRC researchers -- Clover Bench and Martin Zuidhof. He gave industry and academic talks in Alberta, Saskatchewan, Nova Scotia, as well as the US and Colombia, always proudly proclaiming the PRC message. This has led to increased interest by students from around the world wishing to study at the Poultry Research Centre.

Additionally, Dr. Korver was actively engaged with the PRC stakeholders and the Alberta and Canadian Poultry Industry. He attended the Alberta poultry Industry Annual General Meetings In Red Deer. He participated in a meeting in Toronto sponsored by the Turkey Farmers of Canada to discuss strategic planning for encouraging turkey research at Universities in Canada. Dr. Korver attended the Canadian Poultry Research Council Strategic Planning session held in Ottawa. He was the leader of a team presenting the results of a field study conducted in Alberta to Alberta egg producers in Edmonton, Calgary and Lethbridge. He also attended several of the regional meetings held by the Alberta Chicken Producers and the Egg Farmers of Alberta.

Lynn McMullen

Bacteriocins are antimicrobial peptides produced by bacteria. These peptides can be used to control the growth of foodborne pathogens on meats. The bacteriocins produced by lactic acid bacteria can inhibit the growth of *Listeria monocytogenes* on ready-to-eat poultry products. Dr. McMullen's team is evaluating bacteriocins of gram negative organisms that inhibit the growth of *Salmonella* and *Campylobacter*, pathogens of interest in fresh poultry.

High pressure processing technology has been adapted by the meat industry to reduce the numbers of *Listeria monocytogenes* on deli meats. Dr. McMullen evaluated the impact of high pressure processing at low temperatures on the survival of *L. monocytogenes*. She has found that low numbers of *L. monocytogenes* can survive high pressure processing on cooked chicken when processed at low temperatures. She has also evaluated the ability of high pressure processing to control spores of *Clostridium* spp. that have the potential to cause spoilage in deli meats that do not contain nitrites. Pressure alone cannot control bacterial endospores so we have used a multiple hurdle approach. High temperature is needed to control spores but when combined with high pressure and antimicrobials, the amount of time at extreme temperatures is substantially reduced – which has the potential to reduce the impact on the sensory qualities of the products.

Wendy Wismer

Dr. Wismer and her graduate student, Sogol Teflisi, worked with Eduardo Beltranena and Matt Oryschak (ARD) to determine the consumer acceptance of eggs from layers fed *Camelina sativa* meal in their diet.

Jianping Wu

Dr. Wu supervised 13 PhD students (of 3 visiting students, 2 co-supervised, 1 successfully defended), 3 MSc student (1 co-supervised and successfully defended), 1 summer student, 4 PDF (2 completed), 1 research associate, 2 technicians, and 1 visiting professor. Dr. Wu's team received 15 awards of various kinds, noted Alberta Innovates Technology Futures Doctoral Scholarship and 2nd place International Division Award from 2013 IFT from over 100 competitors.

Dr. Wu's team contributed to 14 peer-reviewed papers, 1 patent application, 1 book chapter published, 2 book chapters submitted, 9 conference presentation (of 4 invited), 16 talks/presentations without abstracts made to the industry, academia and government, 5 various grant reports, 8 new grants awarded (NSERC DG renewed for \$40K per year for 5 years), 8 new grants received (6 as PI), \$736 K received as PI in 2013 out of total \$2.276 M. He was also actively involved in research collaboration, and technology transfer including expressed interest from Afinity Life Sciences for commercializing bioactive peptides as anti-ageing products. Dr. Wu is also a Member of Animal Care and Use Committee - Livestock (ACUCL), PRC Board of Directors, Editorial Board of one SCI journal.

Martin Zuidhof

In his research program, Dr. Zuidhof's aim is to improve on or develop new transformative poultry production systems to address major production, uniformity and efficiency challenges. His main focus this year has been to test and refine a pre-commercial prototype Precision Broiler Breeder Feeding System (PBBFS). This year, his team successfully demonstrated that the feeding station can effectively control individual bird feed intake by precisely matching individual BW measurements to BW targets. In a 20 week pilot study with broiler breeder pullets, the prototype dispensed small meals to each bird in the flock multiple times each day - delivering the right amount of feed to the right bird at the right time. In contrast to traditional management of feed restriction, which involves daily or every-other-day feeding, broiler breeder pullets were able to "graze" throughout the day. Birds used the station 0 to 117 times per day, and by 20 weeks, were eating meals on average every 5 to 6 hours. We expect that this will improve their gut health and overall welfare, compared to eating every 24 or 48 hours. By maintaining a steady metabolism (preventing the inefficiency of storing and mobilizing nutrients) they will be more efficient. A full 60 week study will start in 2014, and the project will evaluate alternative BW curves to improve welfare and profitability through flock uniformity, egg production, fertility and hatchability.

Organizational Structure

Board

| Board Member | Representing | Term end date |
|----------------------------|-----------------------|---------------|
| Helen Anne Hudson, Chair | National Industry | 2016 |
| Wes Johnson, Vice chair | Government of Alberta | 2014 |
| Martin Zuidhof | Academic Leader | 2014 |
| Erasmus Okine | AFNS | 2015 |
| Jianping Wu, ex-officio | Researchers | 2015 |
| Susan Novak | Funders | 2016 |
| Karen Kirkwood | Chicken Industry | 2015 |
| Jenna Griffin (Latanville) | Egg Industry | 2013 |
| Susan Schafers | Independent | 2016 |
| Leonard Waldner | Turkey Industry | 2016 |
| Ashley Rietveld | Hatching Egg Industry | 2013 |
| Sunny Mak | Processing | 2016 |
| Tim Nelson | National Industry | 2015 |
| Reg Cliche | Processing | 2016 |

PRC Operations Personnel

| Staff Member | Affiliation | Role |
|--------------------|---|----------------------------|
| Martin Zuidhof | University of Alberta | Academic Leader |
| Valerie Carney | Alberta Agriculture and Rural Development | Technology Transfer |
| Doug Korver | University of Alberta | Teaching and Learning |
| Agnes Kulinski | University of Alberta | Business Development |
| Laurie Heidebrecht | University of Alberta | Administrative Support |
| Lyle Bouvier | University of Alberta | Poultry Unit Manager |
| Nigel Davidson | University of Alberta | Poultry Unit Technician |
| Gilles Hinse | University of Alberta | Poultry Unit Technician |
| Chris Ouellette | University of Alberta | Instrumentation Technician |
| Dana Penrice | University of Alberta | PRC Coordinator |
| Shawn Rankin | University of Alberta | Poultry Unit Technician |

Researchers

| Name (N=13) | Position (% FTE, if less than 100%) | Specialty | Student ¹ | | | Technician | Post doc | Research Associate | Visiting Scholar |
|--------------------|--|---|----------------------|----------|----------|------------|-------------|-----------------------|---------------------|
| | | | Grad | U/G | Visiting | | | | |
| Eduardo Beltranena | Research Scientist, ARD; Adjunct Professor (33%) | Monogastric feeds and feeding | | | | 2 | | 1 | |
| Clover Bench | Assistant Professor | | 0.5 | | | | | | |
| Mirko Betti | Associate Professor | Chemistry/ Biochemistry of muscle foods | 10 | | | | 2 | 1 | |
| Valerie Carney | Research & extension specialist, ARD | Applied poultry research | | | | 1 | | 1 | |
| Ellen Goddard | Professor | Agricultural marketing and business | | | | | | | |
| Douglas Korver | Professor | Poultry nutrition | 5 | | | 1 | | 1 | |
| Lynn McMullen | Professor (10%) | Food microbiology | 5 | | | 3 | 2 | | |
| Aman Ullah | Assistant Professor | Poultry by-products | 1 | | | | | | |
| Wendy Wismer | Associate Professor (10%) | Sensory and consumer science | 1 | | | | | | |
| Jianping Wu | Associate Professor | High value egg utilization | 12 | | 3 | 2 | 1 | 1 | |
| Martin Zuidhof | Associate Professor | Poultry systems | 4.5 | | | 1 | | 1 | |
| | | | 38 | 0 | 3 | 10 | 5 | 6 | 0 |

¹Students co-supervised by two PRC researchers are counted as 0.5

Graduate Students

| Graduate Student | Supervisor | Degree |
|--------------------------------------|-------------------|--------|
| 1. Teryn Gilmet | Bench/Zuidhof | MSc |
| 2. Mohannad Badawi | Betti | MSc |
| 3. Lihui (Mavis) Du | Betti | PhD |
| 4. Daylin Hincampie Martinez | Betti | MSc |
| 5. Yuliya Hrynets | Betti | PhD |
| 6. Yang Liu | Betti and Gaenzle | PhD |
| 7. Xinyao Lu | Betti | MSc |
| 8. Feng Mengmeng | Betti | PhD |
| 9. Hong Pui Khoon | Betti | PhD |
| 10. Henan Wang | Betti | PhD |
| 11. Dan Zang | Betti | MSc |
| 12. Abiodun Bello | Korver | PhD |
| 13. Misaki Cho | Korver | PhD |
| 14. Seyed Fatemi | Korver | MSc |
| 15. Sandeep Nain | Korver | MSc |
| 16. Koonpohl Pongmanee | Korver | PhD |
| 17. Felipe Silva | Korver | MSc |
| 18. Andrea Balutius | McMullen | MSc |
| 19. Christine (Xiaoji) Liu | McMullen | PhD |
| 20. Danielle Robocon | McMullen | MSc |
| 21. Kathleen Satchwell | McMullen | MSc |
| 22. James Zhang | McMullen | MSc |
| 23. Wujun Zhao | Ullah | PhD |
| 24. Sogol Teflsi | Wismer | MSc |
| 25. Ali Akbari | Wu | PhD |
| 26. Nandika Bandara | Wu | PhD |
| 27. Yussef Esparza | Wu | PhD |
| 28. Yuchen Gu | Wu | PhD |
| 29. Forough Jahandideh | Wu | MSc |
| 30. Chamila Koushalya Nimalaratne | Wu and Schieber | PhD |
| 31. Qiyi Li | Wu | MSc |
| 32. Kavstav Majumder | Wu | PhD |
| 33. Sahar Navidghasemizad | Wu and Temelli | PhD |
| 34. Jiandong Ren | Wu | PhD |

| Graduate Student | Supervisor | Degree |
|------------------------|------------|--------|
| 35. Xiaohong Sun | Wu | PhD |
| 36. Dulal Paul | Zuidhof | MSc |
| 37. Airell DesLauriers | Zuidhof | MSc |
| 38. Carlos Lozano | Zuidhof | MSc |
| 39. Kim Ton | Zuidhof | MSc |

Visiting Students and Scholars

| Name | Program | Team |
|-----------------------------|------------------------|------|
| 1. Rossawan Intarasirisawat | PhD (Visiting Student) | Wu |
| 2. Zheng Li | PhD (Visiting Student) | Wu |
| 3. Juan You | PhD (Visiting Student) | Wu |

Technical Support

| Name | Title | Team |
|-----------------------|---------------------|------------|
| 1. Ken Fahner | MSPRU Manager | McMullen |
| 2. Erica Holm | Research Technician | Carney |
| 3. Ross Lowe | Research Technician | McMullen |
| 4. Thania Moraes | Research Technician | Zuidhof |
| 5. Kerry Nadeau | Research Technician | Korver |
| 6. Marina Offengenden | Research Technician | Wu |
| 7. Sareh Panahi | Research Technician | Wu |
| 8. Lea Swan | Research Technician | Beltranena |
| 9. Dharma Shrestha | Research Assistant | Beltranena |
| 10. Patrick Ward | Research Technician | McMullen |

Post-Doctoral Fellows

| Name | Team | Subject |
|-------------------------|----------|--|
| 1. Satyanarayana Bejani | Betti | Valorization of Poultry processing by-products |
| 2. Zied Khiari | Betti | Valorization of Poultry processing by-products |
| 3. Muhammad Khosa | Wu | Value added egg science |
| 4. Petr Miller | McMullen | Food microbiology |
| 5. Januana Tixeira | McMullen | Food microbiology |

Research Associates

| Name | Title | Team |
|-----------------------------|--------------------|------------|
| 1. Subhadeep Chakrabati | Research Associate | Wu |
| 2. Maurice Ndagijimana | Research Associate | Betti |
| 3. Matt Oryschak | Research Associate | Beltranena |
| 4. Jennifer Saunders-Blades | Research Associate | Korver |
| 5. Brenda Schneider | Research Associate | Carney |
| 6. Irene Wenger | Research Scientist | Zuidhof |

Research Projects (\$3,228,414)

| Research Projects Bacteriology / Food Safety | | (Received in 2013-2014) | | | \$3,466,215 \$738,023 | |
|---|---|---------------------------------------|---------------------------------------|---------------------|--------------------------|--|
| Granting Body | Abbreviated Title | Amount received in current year | Applicant(s) | Planned Duration | Total value of grant | |
| NSERC | Bacteriocins for Food Safety | \$31,000 | L. McMullen (PI) | 2012- 2017 | \$155,000 | |
| NSERC CRD/Griffith Laboratories | Discovery and Structure Activity of Bacteriocins | \$100,000 | McMullen Vederas | 2011- 2014 | \$300,000 | |
| ALMA/AI-BIOa | Impact of high pressures on L. monocytogenes | \$246,725 | McMullen Gänzle | 2013- 2016 | \$276,725 | |
| AI-BIOb | Increasing yield and activity of bacteriocins | \$152,000 | Kaur McMullen Wishart Stiles | 2013- 2016 | \$495,000 | |

| | | | | | |
|---|---------------------------------|----------|-----------------------------|--------------|-----------|
| CFI IOF | Meat Safety and Processing Unit | \$57,955 | McMullen | 2009 – 2014 | \$381,007 |
| Saskatchewan Agriculture Development Fund | Quality of low salt meats | \$58,843 | Shand McMullen Korber | 2010 to 2014 | \$283,058 |
| ALMA/AI-BIO | Safety of low salt meats | \$91,500 | McMullen Shand Korber | 2010-2014 | \$520,375 |

| | |
|---------------------------|------------------|
| Feed and Nutrition | \$706,303 |
|---------------------------|------------------|

| Granting Body | Abbreviated Title | Amount received in current year | Applicant(s) | Planned Duration | Total value of grant |
|---------------------------|--|---------------------------------|-----------------|------------------|----------------------|
| Chicken Farmers of Canada | Broiler and Breeder Bone Differentiation | \$9,960 | Korver Bruce | 2013 | \$9,960 |
| Alltech, Inc. | Enzyme Pelleting Stability | \$5,000 | Korver | 2013 | \$5,000 |

| | | Renema | | | |
|----------------------------------|---|----------|------------------------------------|---------------|-----------|
| AB Vista | Layer Phytase and Bone Density | \$46,020 | Korver | 2013 | \$46,020 |
| University of Alberta | Layer Phytase and Bone Density | \$38,575 | Korver | 2013 | \$38,575 |
| DSM | Nutritional Products Breeder MaxiChick and Chick Quality | \$67,480 | Korver Renema | 2012- 2013 | \$134,960 |
| University of Alberta | Nutritional Products Breeder MaxiChick and Chick Quality | \$46,985 | Korver Renema | 2012- 2013 | \$93,970 |
| ALMA | Prebiotics in Laying Hen Diets | \$99,000 | Korver Ricke (U. of Arkansas) | 2013 | \$11,040 |
| University of Alberta | Prebiotics in Laying Hen Diets | \$19,250 | Korver Ricke (U. of Arkansas) | 2013 | \$19,250 |
| University of Arkansas | Prebiotics in Laying Hen Diets | \$38,500 | Korver Ricke (U. of Arkansas) | 2013 | \$38,500 |
| Agriculture Development Fund, SK | Safety and efficacy of feeding camelina meal to egg laying hens | \$81,773 | Beltranena Christensen Scott | 2012- 2014 | \$383,830 |

| | | | | | |
|--------------------------|-----------------------------------|-----------|--|---------------|-----------|
| | | | van Kessel | | |
| ALMA | SDA Flax in Laying Hen Diets | \$88,225 | Korver Weselake Renema Betti Zuidhof | 2013- 2015 | \$94,964 |
| University of Alberta | SDA Flax in Laying Hen Diets | \$114,223 | Korver Weselake Renema Betti Zuidhof | 2013- 2015 | \$208,946 |
| Diamond V Mills | Yeast Extracts and Broiler Health | \$32,102 | Korver | 2013 | \$32,102 |
| University of Alberta | Yeast Extracts and Broiler Health | \$19,250 | Korver | 2013 | \$19,250 |

| | | | | | |
|----------------------------------|--|--|--|--|-----------------|
| Management and Physiology | | | | | \$68,271 |
|----------------------------------|--|--|--|--|-----------------|

| Granting Body | Abbreviated Title | Amount received in current year | Applicant(s) | Planned Duration | Total value of grant |
|---------------|-------------------|---------------------------------------|--------------|---------------------|-------------------------|
|---------------|-------------------|---------------------------------------|--------------|---------------------|-------------------------|

| | | | | | |
|-----------------|----------------------------|----------|---------|---------------|----------|
| Growing Forward | Turkey Welfare and Quality | \$68,271 | Zuidhof | 2012- 2013 | \$68,271 |
|-----------------|----------------------------|----------|---------|---------------|----------|

| Meat and Egg Products and Processes | | | | | \$1,451,250 | |
|--|--|---------------------------------|--------------|------------------|----------------------|--|
| Granting Body | Abbreviated Title | Amount received in current year | Applicant(s) | Planned Duration | Total value of grant | |
| Agriculture and Agri-Food Council (CAAP program) | Antihypertensive Activity of Laying Hen Eggs | \$103,582 | Wu Jacobs | 2010-2014 | \$439,757 | |

| | | | | | |
|--|--|-----------|--|-----------|---|
| Egg Farmers of Canada (EFC)/Poultry Industry Council (PIC)/NSERC CRD/Burnbrae Farms Ltd. | Antioxidants in Laying Hen Eggs | \$117,013 | Wu | 2013-2016 | \$315,520 |
| NSERC RT | | \$131,679 | Field (PI) Wu and others | 2012-2013 | \$131,679 |
| Canadian Poultry Research Council/ALMA | Biopolymer Nanocomposites for packaging applications | \$63,800 | Ullah(PI) Wu Temelli Siddique | 2013 | \$210,000 |
| Agriculture Funding Consortium Council/Canadian Poultry Research Council | Biopolymer-based nanocomposites from poultry byproducts for packaging applications | \$70,000 | Ullah Wu Temelli Siddique | 2013-2016 | \$150,000 (ALMA) \$60,000 (CPRC) |
| Alberta Livestock Meat Agency, Ltd. | Development of infant formula from ovomucin | \$70,400 | Wu Field | 2013-2014 | \$105,600 |

(ALMA) and Egg
Farmers of Alberta

Ganezle

| | | | | | |
|--|---|-----------|------------------------------|---------------|-----------|
| Grand Challenges Canada (GCC) | Filters from poultry feathers for removal of Arsenic from drinking water in developing countries | \$46,550 | Ullah Bajaj | 2013 | \$113,000 |
| Agriculture and Agri-Food Council (CAAP program) | Functional egg bioactive peptides: scale-up processing and in vivo efficacy | \$115,805 | Wu Davidge Jacobs | 2011- 2014 | \$354,315 |
| ALMA | Functional ingredients from poultry bone biomass: extraction, isolation and purification of chondroitin sulfate | \$73,333 | Betti Pietraski | 2012- 2015 | \$220,000 |
| Maple Leaf | Functional ingredients from poultry bone biomass: extraction, isolation and purification of chondroitin sulfate | \$2,000 | Betti Pietraski | 2012- 2016 | \$5,000 |
| ALMA | Functionalized peptides for skin care produced from bovine and poultry collagen biomass | \$50,750 | Betti Ndagijimana Sato | 2013- 2015 | \$101,500 |
| AI Bio | Functionalized peptides for skin care produced from bovine and poultry collagen biomass | \$49,500 | Betti Ndagijimana Sato | 2013- 2015 | \$99,000 |
| Alberta Chicken Producers | Functionalized peptides for skin care produced from bovine and poultry collagen biomass | \$1,250 | Betti Ndagijimana Sato | 2013- 2015 | \$2,500 |

| | | | | | |
|--|---|-----------|--------------------------|-----------|-----------|
| Agriculture and Agri-Food Council (CAAP program) | Health-promoting components in Laying Hen Eggs | \$76,270 | Wu | 2011-2013 | \$185,661 |
| ALMA | Innovative functional ingredients from underutilized poultry proteins: salty and "kokumi: peptides | \$55,000 | Betti Gaenzle Ndagijmana | 2012-2014 | \$165,000 |
| AI-Bio | Innovative functional ingredients from underutilized poultry proteins: salty and "kokumi: peptides | \$55,000 | Betti Gaenzle Ndagijmana | 2012-2014 | \$165,000 |
| Alberta Livestock Meat Agency (ALMA) | Learning from grandma: developing valuable functional food ingredients from spent hens | \$72,519 | Wu Field | 2011-2013 | \$146,400 |
| Agriculture Funding Consortium | Pilot preparation and application of formaldehyde-free wood adhesive from Alberta renewable materials | \$100,000 | Wu Zeng Chen | 2013-2015 | \$200,000 |
| ALMA | Preparation and characterization of high quality gelatin from different poultry sources. | \$31,175 | Betti Pietraski | 2011-2014 | \$92,500 |
| Alberta Chicken Producers | Preparation and characterization of high quality gelatin from different poultry sources. | \$1,250 | Betti Pietraski | 2011-2014 | \$2,500 |
| RossDown Natural Farms | Preparation and characterization of high quality gelatin from different poultry sources. | \$5,000 | Betti Pietraski | 2011-2014 | \$15,000 |

| | | | | | |
|--|---|----------|-------------------------------|-----------|-----------|
| NSERC Engagement Grant | Removing phosvitin for improving egg yolk stability in food applications | \$25,000 | Wu | 2013 | \$25,000 |
| Food and Health Innovation Initiative (Vitamin Fund) | Simulated gastrointestinal digestion on the bioaccessibility and antioxidant activity of carotenoids in cooked eggs using a dynamic gastrointestinal system (TIM-1) | \$16,374 | Wu | 2013-2014 | \$16,374 |
| NSERC RT | Zetasizer Nano ZSP with Microrheology for Studying Molecular, Colloidal and Interfacial Interactions in Complex Fluids | \$78,000 | Zeng (PI) Wu and others | 2013-2014 | \$78,000 |
| NSERC DG | Antioxidant peptides in inflammatory and endothelial function | \$40,000 | Wu | 2013-2018 | \$200,000 |

| | |
|------------------------------------|------------------|
| Metabolism and Reproduction | \$118,442 |
|------------------------------------|------------------|

| Granting Body | Abbreviated Title | Amount received in current year | Applicant(s) | Planned Duration | Total value of grant |
|------------------|--|---------------------------------|--------------|------------------|----------------------|
| NSERC | Bone metabolism & Inflammation in Fowl | \$25,000 | Korver | 2013-2018 | \$125,000 |
| AI-Bio | Incubation Temperature and Chick Quality | \$33,422 | Korver | 2012-2014 | \$71,844 |
| Canadian Poultry | Incubation Temperature and Chick | \$24,000 | Korver | 2012- | \$24,000 |

| | | | | | |
|--------------------------|--|----------|--------|-----------|----------|
| Research Council | Quality | | | 2014 | |
| Poultry Industry Council | Incubation Temperature and Chick Quality | \$16,770 | Korver | 2012-2014 | \$16,770 |
| University of Alberta | Incubation Temperature and Chick Quality | \$19,250 | Korver | 2012-2014 | \$38,500 |

| | |
|------------------------|------------------|
| Poultry Systems | \$534,735 |
|------------------------|------------------|

| Granting Body | Abbreviated Title | Amount received in current year | Applicant(s) | Planned Duration | Total value of grant |
|---------------------------------|--------------------------|---------------------------------|---------------|------------------|----------------------|
| Alberta Chicken Producers | Precision Feeding System | \$2,500 | Zuidhof Bench | 2011-2015 | \$7,500 |
| AI Bio | Precision Feeding System | \$30,000 | Zuidhof Bench | 2011-2015 | \$60,000 |
| ALMA | Precision Feeding System | \$0 | Zuidhof Bench | 2011-2015 | \$351,757 |
| Alberta Hatching Egg Producers | Precision Feeding System | \$0 | Zuidhof | 2011-2015 | \$17,500 |
| Canadian Hatching Egg Producers | Precision Feeding System | \$0 | Zuidhof | 2011-2013 | \$10,000 |

| | | | | | |
|-----------------------------------|--------------------------|-----------|---------|-----------|-----------|
| Poultry Industry Council | Precision Feeding System | \$15,000 | Zuidhof | 2011-2014 | \$50,000 |
| Agriculture and Agri-Food Council | Precision Feeding System | \$487,235 | Zuidhof | 2011-2013 | \$487,235 |

| Learning/Teaching projects | | | | | \$0 |
|----------------------------|-------------------|---------------------------------|--------------|------------------|----------------------|
| Granting Body | Abbreviated Title | Amount received in current year | Applicant(s) | Planned Duration | Total value of grant |

PRC Financials 2013-2014

| Income 2013 - 2014 | | Actuals as of March 31, 2014 | |
|--------------------------------|-------------------|------------------------------|-------------------|
| Industry | Cash | In-Kind | Total |
| Alberta Turkey Producers | 28,042.00 | | 28,042.00 |
| Alberta Hatching Egg Producers | 31,902.00 | | 31,902.00 |
| Alberta Chicken Producers | 92,016.00 | | 92,016.00 |
| Egg Farmers of Alberta | 33,600.00 | | 33,600.00 |
| Egg Farmers of Canada | 15,000.00 | | 15,000.00 |
| Burnbrae Farms | 8,500.00 | | 8,500.00 |
| Maple Leaf | 15,000.00 | | 15,000.00 |
| Poultry Health Services | | 35,000.00 | 35,000.00 |
| Sub-total | 224,060.00 | 35,000.00 | 259,060.00 |
| Opening balance | 85,117.44 | | 85,117.44 |
| TOTAL INDUSTRY | 309,177.44 | 35,000.00 | 344,177.44 |

| | | | |
|-------------------|------------------|-------------------|-------------------|
| AARD | 43,000.00 | 337,600.00 | 380,600.00 |
| Opening balance | 10,000.00 | | 10,000.00 |
| TOTAL AARD | 53,000.00 | 337,600.00 | 390,600.00 |

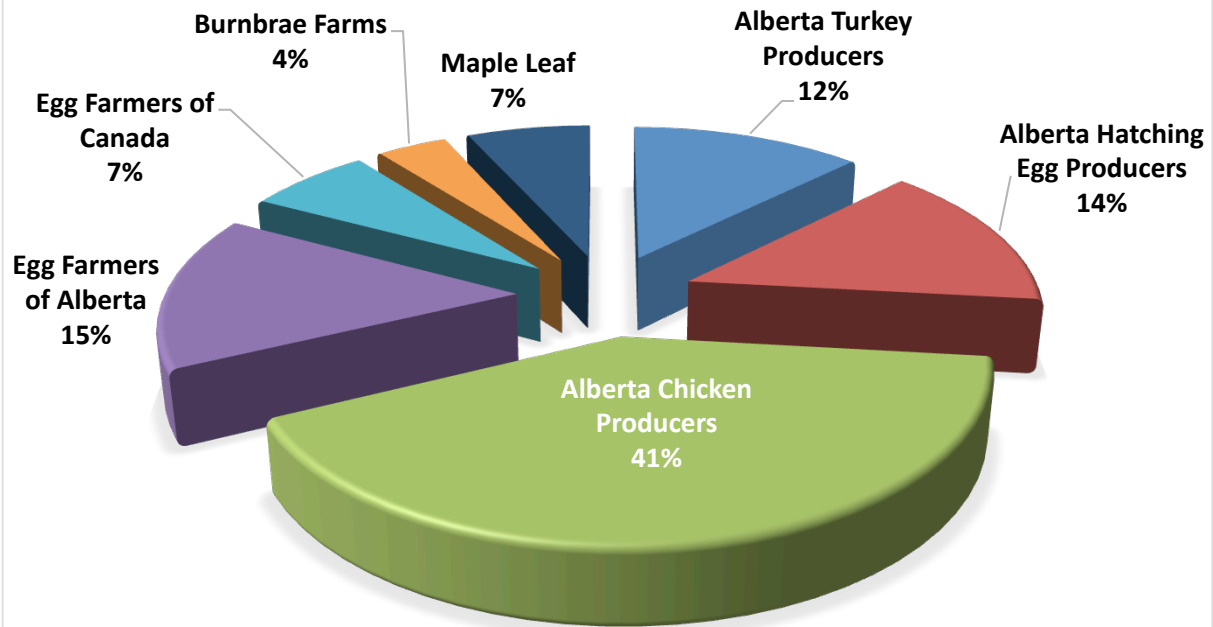
| | | | |
|--------------------------|-------------------|--|-------------------|
| ALMA | 31,466.00 | | 31,466.00 |
| AI- BIO | 100,000.00 | | 100,000.00 |
| Sub-total | 131,466.00 | | 131,466.00 |
| Opening balance* | 570,609.94 | | 570,609.94 |
| TOTAL ALMA/AI-BIO | 702,075.94 | | 702,075.94 |

*ALMA provided \$900,000 of the three year \$931,466 funding in 2012/2013

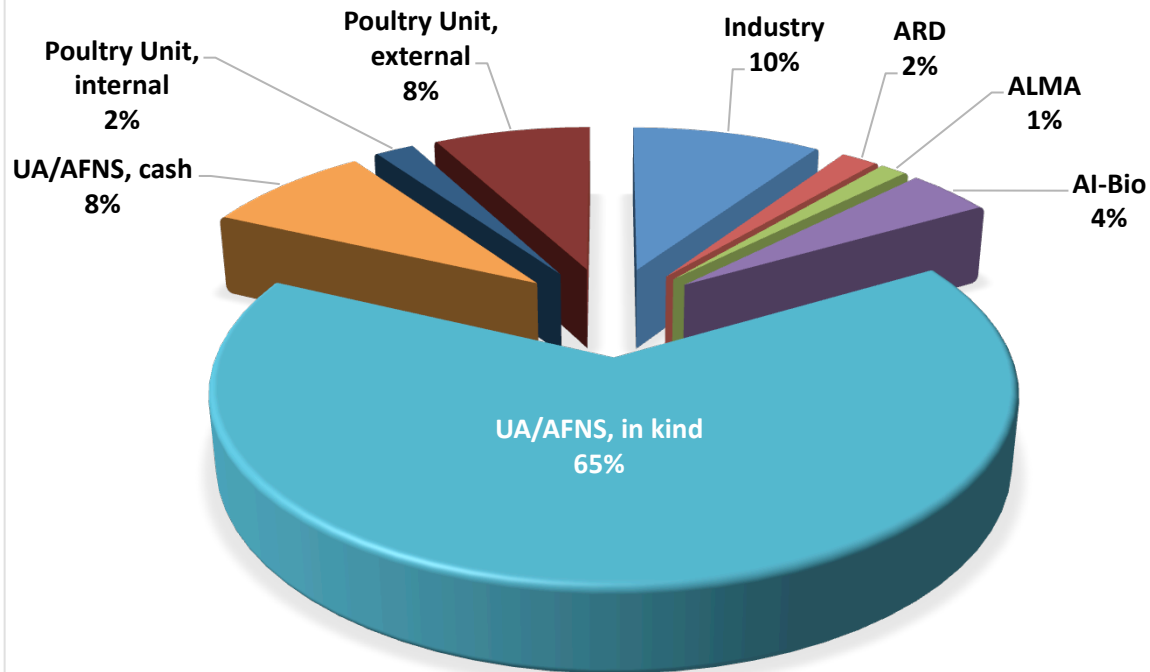
| | | | |
|---------------------------------|-------------------|---------------------|---------------------|
| UofA | | | |
| UofA/AFNS | 199,383.62 | 1,552,480.00 | 1,751,863.62 |
| Poultry Unit (Internal revenue) | 45,777.53 | | 45,777.53 |
| Poultry Unit (External revenue) | 185,905.54 | | 185,905.54 |
| Sub-total | 431,066.69 | 1,552,480.00 | 1,983,546.69 |
| Opening balance | 15,167.00 | | 15,167.00 |
| Total UofA | 446,233.69 | 1,552,480.00 | 1,998,713.69 |

| | Cash | In-Kind | Total |
|---------------------|---------------------|---------------------|---------------------|
| Total Income | 1,510,487.07 | 1,925,080.00 | 3,435,567.07 |

PRC Funding - Industry sources received in 2013-2014 (\$224,060)



**PRC Funding - All sources received in 2013-2014
(\$2,417,073)**



| Expenses 2013 - 2014 | Actuals as of March 31, 2014 | | |
|-----------------------|------------------------------|---------------------|---------------------|
| | Cash | In-Kind | Total |
| Salaries and benefits | 866,412.83 | | 866,412.83 |
| Supplies | 168,078.76 | | 168,078.76 |
| Travel | 6,046.05 | | 6,046.05 |
| Equipment | 19,959.41 | | 19,959.41 |
| Overhead | 2,500.00 | | 2,500.00 |
| Total Expenses | 1,062,997.05 | 1,925,080.00 | 2,988,077.05 |

| Revenue/Expense Summary 2013 - 2014 | Actuals as of March 31, 2014 | | |
|-------------------------------------|------------------------------|--------------|--------------|
| | Cash | In-Kind | Total |
| Total Income (incl. carryover) | 1,510,487.07 | 1,925,080.00 | 3,435,567.07 |
| Total Expenses | 1,062,997.05 | 1,925,080.00 | 2,988,077.05 |
| Total carryover to 2014/2015 | 447,490.02 | 0.00 | 447,490.02 |

Budget 2014 - 2015

Income 2014 -2015 (Budget)

| Industry | Cash | In-Kind | Total |
|--------------------------------|-------------------|------------------|-------------------|
| Alberta Turkey Producers | 28,883.00 | | 28,883.00 |
| Alberta Hatching Egg Producers | 32,859.00 | | 32,859.00 |
| Alberta Chicken Producers | 93,860.00 | | 93,860.00 |
| Egg Farmers of Alberta | 35,280.00 | | 35,280.00 |
| Egg Farmers of Canada | 15,000.00 | | 15,000.00 |
| Burnbrae Farms | 8,500.00 | | 8,500.00 |
| Lilydale* | 30,000.00 | | 30,000.00 |
| Maple Leaf | 15,000.00 | | 15,000.00 |
| Poultry Health Services | | 35,000.00 | 35,000.00 |
| Sub-total | 259,382.00 | 35,000.00 | 294,382.00 |
| Opening balance | 75,478.24 | | 75,478.24 |
| TOTAL INDUSTRY | 334,860.24 | 35,000.00 | 369,860.24 |

*Represents years 2 and 3

| | | | |
|-------------------|------------------|-------------------|-------------------|
| AARD | 43,000.00 | 337,600.00 | 380,600.00 |
| Opening balance | 17,360.62 | | 17,360.62 |
| TOTAL AARD | 60,360.62 | 337,600.00 | 397,960.62 |

| | | | |
|--------------------------|-------------------|--|-------------------|
| ALMA | 0.00 | | 0.00 |
| AI- BIO | 100,000.00 | | 100,000.00 |
| Sub-total | 100,000.00 | | 100,000.00 |
| Opening balance | 281,172.23 | | 281,172.23 |
| TOTAL ALMA/AI-BIO | 381,172.23 | | 381,172.23 |

| | | | |
|---------------------------------|-------------------|---------------------|---------------------|
| UofA | | | |
| UofA/AFNS | 203,000.00 | 1,552,480.00 | 1,755,480.00 |
| Poultry Unit (Internal revenue) | 40,000.00 | | 40,000.00 |
| Poultry Unit (External revenue) | 165,000.00 | | 165,000.00 |
| Sub-total | 408,000.00 | 1,552,480.00 | 1,960,480.00 |
| Opening balance | 73,478.93 | | 73,478.93 |
| Total UofA | 481,478.93 | 1,552,480.00 | 2,033,958.93 |

| | Cash | In-Kind | Total |
|---------------------|--------------|--------------|--------------|
| Total Income | 1,257,872.02 | 1,925,080.00 | 3,182,952.02 |

Expenses 2014 - 2015 (Budget)

| | Cash | In-Kind | Total |
|-----------------------|---------------------|---------------------|---------------------|
| Salaries and benefits | 795,000.00 | | 795,000.00 |
| Supplies | 190,000.00 | | 190,000.00 |
| Travel | 15,000.00 | | 15,000.00 |
| Equipment | 25,000.00 | | 25,000.00 |
| Overhead | 7,500.00 | | 7,500.00 |
| Total Expenses | 1,032,500.00 | 1,925,080.00 | 2,957,580.00 |

**Revenue/Expense Summary 2014 - 2015
(Budget)**

| | Cash | In-Kind | Total |
|--------------------------------|--------------|--------------|--------------|
| Total Income (incl. carryover) | 1,257,872.02 | 1,925,080.00 | 3,182,952.02 |
| Total Expenses | 1,032,500.00 | 1,925,080.00 | 2,957,580.00 |
| Total carryover to 2014/15 | 225,372.02 | 0.00 | 225,372.02 |

Poultry Unit Financial Report 2013-2014

| Income 2013 - 2014 | Actuals as of March 31, 2014 |
|---------------------------------|------------------------------|
| | Total |
| UofA/AFNS | 199,383.62 |
| Poultry Unit (Internal revenue) | 45,777.53 |
| Poultry Unit (External revenue) | 185,905.54 |
| Sub-total | 431,066.69 |
| Opening balance | 15,167.00 |
| Total Income | 446,233.69 |

| Expenses 2013 - 2014 | Actuals as of March 31, 2014 |
|------------------------|------------------------------|
| | Total |
| Salaries and benefits | 282,483.30 |
| Supplies | 70,312.05 |
| Equipment | 19,959.41 |
| Total Expenses* | 372,754.76 |

*Additional unit costs of \$80,000 were moved to in Industry and ARD funding

| Income/Expense Summary 2013 - 2014 | Actuals as of March 31, 2014 |
|-------------------------------------|------------------------------|
| Total Income | 446,233.69 |
| Total Expenses | 372,754.76 |
| Carryover/surplus to 2014/15 | 73,478.93 |

Poultry Unit Budget 2014-2015

Income 2014 - 2015 (budget)

| | Total |
|---------------------------------|-------------------|
| UofA/AFNS | 203,000.00 |
| Poultry Unit (Internal revenue) | 40,000.00 |
| Poultry Unit (External revenue) | 165,000.00 |
| Sub-total | 408,000.00 |
| Opening balance | 73,478.93 |
| Total Income | 481,478.93 |

Expenses 2014 - 2015 (budget)

| | Total |
|------------------------|-------------------|
| Salaries and benefits | 300,000.00 |
| Supplies | 75,000.00 |
| Equipment | 25,000.00 |
| Total Expenses* | 400,000.00 |

*Additional unit costs of \$80,000 have been budgeted in Industry and ARD funding

Income/Expense Summary 2014 - 2015 (budget)

| | |
|---------------------------------------|------------------|
| Total Income | 481,478.93 |
| Total Expenses | 400,000.00 |
| Carryover (surplus) to 2015/16 | 81,478.93 |

Facility Usage

Research Facilities

| Facility | Utilization Rate (%) | | | | |
|---|----------------------|-------------------------|----------------|--------------|-----------------|
| | Overall | Broiler & Turkey Trials | Breeder Trials | Layer Trials | Unit Operations |
| Brooder house (48 floor pens) | 53 | 5 | 12 | | 36 |
| Breeder hen cages (288 individual cages) | 100 | | 14 | 86 | |
| Breeder male cages (60 individual cages) | 15 | | 15 | | |
| Nutrition house (32 pens) | 43 | 43 | | | |
| Specht pullet cages (64 group cages) | 25 | 10 | | 15 | 25 |
| Environmental chambers | 29 | 29 | | | |
| Test house - Floor pens (rare breeds) | 100 | | | | 100 |
| Test House - Conventional cages | 100 | | | 100 | |
| Test House - Colony cages | 100 | | | | 100 |
| Broiler Processing Plant (3 days per use) | 6 | 6 | | | |
| Hatchery | | | | | |
| Setter use AVN | 6 | 6 | | | |
| Hatcher use AVN | 6 | 6 | | | |
| Setter use BIG J | 2 | | 1 | | 1 |
| Hatcher use BIG J | 2 | | 1 | | 1 |

Non-Research Facilities

| Facility | Description | Utilization |
|--------------------------|---|--------------------|
| Lilydale Room | Combined producer meetings | |
| | Processors | |
| | PRC alumni, exec group & educational institutions | 59 days |
| | U of A, safety, animal care, animal handling, HACCP | 2 days |
| | Industry related workshops (swine, dairy, AAF, etc.) | 4 days |
| | Student presentations & community learning | 38 days |
| Alberta Turkey Producers | Heavy use by graduate students, undergraduate students, technicians and researchers | 25 person hours /d |
| Computer Lab | | |

Evidence of Productivity

Articles published in refereed journals (n=32)

1. Ali, S.; Rasool, N.; Ullah, A.; Nasim, F.; Yaqoob, A.; Zubair, M.; Rashid, U.; Riaz, M., Design and Synthesis of Arylthiophene-2-Carbaldehydes via Suzuki-Miyaura Reaction and Their Biological Evaluation. *Molecules*, 2013, 18: 14711-14725.
2. Bandara, N., Chen, L. & Wu, J.* (2013). Adhesive properties of modified tritical distillers grain proteins. *International Journal of Adhesion & Adhesives* 44: 122–129.
3. Bejjani, S. and Wu, J.* (2013). Transport of IRW, an Ovotransferrin Derived Antihypertensive Peptide, in Human Intestinal Epithelial Caco-2 cells. *Journal of Agricultural and Food Chemistry* 61 (7): 1487–1492.
4. Carney, V. L., B. L. Schneider, D. E. Holm, I. Wenger, R. A. Renema. 2013. Research in the Real World: Field studies to support extension programs. Poultry Science Association, San Diego, CA, Jul 22-25, Abstr.
5. Du L., Z. Khiari, Z. Pietrasik and M. Betti. 2013. Physico-chemical and functional properties of gelatins extracted from turkey and chicken heads. *Poultry Science* 92(9):2463-74 . PMID:23960131
6. Gu, Y., & Wu, J.* (2013). LC-MS/MS coupled with QSAR modeling in characterizing of angiotensin I-converting enzyme inhibitory peptides from soybean proteins. *Food Chemistry* 141(3): 2682-2690.
7. Goddard, E. J. Hobbs, B. Innes, P. Romanowska and A. Uzea. 2013. Risk Perceptions and Preferences for Ethical and Safety Credence Attributes, *American Journal of Agricultural Economics*. Vol 95. No 2. Pp 390-396, January.
8. Hofstetter, S, R. Winter, LM McMullen and MG Gänzle. 2013. In situ determination of *Clostridium* endospore membrane fluidity during pressure-assisted thermal processing in combination with nisin or reutericyclin. *Applied and Environmental Microbiology* 79:2103-2106.
9. Hofstetter, S., D. Gebhardt, L. Ho, M. Gänzle, L M. McMullen. 2013. Effects of nisin and reutericyclin on resistance of endospores of *Clostridium* spp. to heat and high pressure. *Food Microbiology* 34:46-51.
10. Hrynets Y., Ndagijimana M. and M. Betti. 2014. Transglutaminase-catalyzed glycosylation of natural actomyosin (NAM) using glucosamine as amine donor: functionality and gel microstructure. *Food Hydrocolloids* 36:26–36.
11. Hrynets Y., Ndagijimana M. and M. Betti. 2013. Non-enzymatic glycation of natural actomyosin (NAM) with glucosamine in a liquid system at moderate temperatures. *Food Chemistry* 139(1-4):1062-1072. PMID:23561210
12. Huang, W-Y., Davidge, S. T. & Wu, J.* (2013) Bioactive natural constituents from food sources - potential use in hypertension prevention and treatment. *Critical Reviews in Food Science and Nutrition* 53(6), 615-630.
13. Intarasirisawat, R., Benjakul, S., Wu, J.* & Visessanguan, W. (2013). Isolation of antioxidative and ACE inhibitory peptides from protein hydrolysate of skipjack (*Katsuwana pelamis*) roe. *Journal of Functional Foods* 5(4): 1854–1862.
14. Jones, TH, KM Vail, LM McMullen. 2013. Filament formation by foodborne bacteria under sublethal stress. *International Journal of Food Microbiology* 165:97-110.
15. Khiari Z., A. O. Dileep, Z. Pietrasik and M. Betti. 2013. Evaluation of poultry protein isolate as a food ingredient: Physicochemical properties and sensory characteristics of marinated chicken breasts. *Journal of Food Science* 78(7):S1069-75. PMID:23772877

16. Khoon H. P., D. Gottardi, M. Ndagijimana and M. Betti. 2014. Glycation and transglutaminase mediated glycosylation of fish gelatin peptides with glucosamine enhance bioactivity. *Food Chemistry* 142:285–293. PMID:24001843
17. Khosa, M. A.; Wu, J.; Ullah, A. Chemical Modification, Characterization, and Application of Chicken Feathers as Novel Biosorbent. *RSC Advances* 2013, 3: 20800-20810.
18. Khosa, M. A.; Ullah, A. A Sustainable Role of Keratin Biopolymer in Green Chemistry: A Review. *J. Food Processing & Beverages*, 2013, 1(1): 8-15.
19. Li, S., Offendengen, M., Fentabil, A. M., Gänzle, M. G. & Wu, J.* (2013). Effect of lactobacilli fermentation on IgE binding ability of egg white proteins. *Food Research International* 52(1): 359–366.
20. Lothans CT, KM Towle, M. Miskolzie, RT McKay, MJ van Belkum, LM McMullen and JC Vederas. 2013. Solution structures of the linear leaderless bacteriocins enterocin 7A and 7B resemble carnocyclin A, a circular antimicrobial peptide. *Biochemistry* 52:3987-3994.
21. Majumder, K., Chakrabarti, S., Morton, J. S., Panahi, S., Kaufman, S., Davidge, S. T. & Wu, J.* (2013) Egg-derived tri-peptide IRW exerts antihypertensive effects in spontaneously hypertensive rats. *Plos One* 8(11): e82829 (14 pages). doi:10.1371/journal.pone.0082829.
22. Majumder, K., Chakrabarti, S., Davidge, S. T. & Wu, J.* (2013). Structure and activity study of egg protein ovotransferrin derived tripeptides (IRW and IQW) on endothelial inflammatory response and oxidative stress. *Journal of Agricultural and Food Chemistry* 61(9): 2120-2129.
23. Majumder, K., Panahi, S., Kaufman, S. & Wu, J.* (2013). Fried egg digest decreases blood pressure in spontaneous hypertensive rats. *Journal of Functional Foods* 5: 187-194.
24. Nimalaratne, C., Lopes-Lutz, D., Schieber, A. & Wu, J.* (2012). Effect of domestic cooking methods on egg yolk xanthophylls. *Journal of Agricultural and Food Chemistry* 60(51): 12547-52. (not reported in 2012)
25. Offengenden, M., and J. Wu*. 2013. Egg white ovomucin gels: structured fluids with weak polyelectrolyte properties. *RSC Advances* 3(3): 910-917.
26. Ren, Y., T. I. Perez, M. J. Zuidhof, R. A. Renema and J. Wu*. 2013. Oxidative Stability of Omega-3 Polyunsaturated Fatty Acids Enriched Eggs. *Journal of Agricultural and Food Chemistry* 61(47): 11595–11602.
27. Schneider, B. L., Carney, V. L., D. E. Holm, I. Wenger, R. A. Renema. 2013. Research in the real world: Combining field research and extension. Poultry Science Association, San Diego, CA, Jul 22-25, Abstr.
28. Srichamroen A., T. Nakano , Z. Pietrasik, L. Ozimek and M. Betti. 2013. Chondroitin sulfate extraction from broiler chicken cartilage by tissue autolysis. *LWT Food Science & Technology* 50:607-612.
29. Ullah, A., and J. Wu. 2013. Feather Fiber based thermoplastics: Effects of plasticizers on material properties. *Macromol. Mater. Eng.*, 2013, 298: 153-162.
30. Wang, H., J. Wu and M. Betti. 2013. Chemical, rheological and surface morphologic characterization of spent hen proteins extracted by pH-shifting processing with or without the presence of cryoprotectants. *Food Chemistry* 139(1–4): 710–719.
31. Yegani, M. and D. R. Korver. 2013. Effects of corn source and exogenous enzymes on growth performance and nutrient digestibility in broiler chickens. *Poult. Sci.* 92 :1208–1220.
32. Yegani, M., M.L. Swift, R.T. Zijlstra and D.R. Korver. 2013. Prediction of energetic value of wheat and triticale in broiler chicks: A chick bioassay and an in vitro digestibility technique. *Anim. Feed Sci. Technol.* 183:40– 50.

Proceedings (n=2)

1. Korver, D. Implications of changing immune function through nutrition in poultry 64th North Central Avian Disease Conference, Minnesota Poultry Federation, St. Paul, MN March 12, 2013
2. Carney, V. L., B. L. Schneider. 2013. Proceedings for the Evening of Learning and Sharing poster presentations in conjunction with the PRC Annual General Meeting. May 2013.

Presentations and Abstracts (n=132)

1. Akbari, A. and J. Wu. Application of an egg white protein in drug delivery. Poultry Research Centre AGM. Edmonton, Alberta. May 28, 2013.
2. Arshad, M.*, A. Ullah, S. Saied, F. Z. Basha. PEG-Lipid Triblock Copolymer and 3-Arm Star Block Copolymer Nanoparticles for Drug Delivery Applications, 12th International and 24th National Conference, Bahauddin Zakariya University, Multan, PK. October 28, 2013.
3. Arshad, M., and A. Ullah*. Amphiphilic Nanoparticles from Canola Oil: PEGylation, Characterization and Solution Self-assembly, 21st Bio-Environmental Polymer Society (BEPS) Annual Meeting, University of Warwick, UK. September 20, 2013.
4. Arshad, M., M. A. Khosa, and A. Ullah*. Biocomposites from Modified Keratin Fiber and Renewable Lipids, 21st Bio-Environmental Polymer Society (BEPS) Annual Meeting, University of Warwick, UK. September 18, 2013.
5. Backer*, E. S. and D. Korner. Poultry Research Centre Student Club. Alberta Poultry Industry Annual meetings. Red Deer, AB. February 26, 2013.
6. Badawi, M., and M. Betti. Improvement of functional properties of poultry gelatin by high pressure processing (HPP). Poultry Research Centre AGM. Edmonton, Alberta. May 28, 2013..
7. Balutis, A. and L.M. McMullen. Bacteriocin production by *Carnobacterium maltaromaticum* UAL307. Canadian Institute of Food Science and Technology Annual General Meeting, Edmonton, AB. May 8, 2013.
8. Bandara, N. and J. Wu. Adhesive potential of proteins extracted from mechanically separated poultry meat residue. International Wood Adhesive Conference, Toronto, Canada. October 8-12, 2013.
9. Bandara, N. and J. Wu. Potential of Poultry industry By-products in Adhesive Development. Poultry Research Centre AGM. Edmonton, Alberta. May 28, 2013.
10. Bejjani and M. Betti. Collagen peptides improve your smile. Poultry Research Centre AGM. Edmonton, Alberta. May 28, 2013.
11. Beltranena, E., and M. Oryschak. Not all canola meals are equal: Nutritional quality of meals produced by different oil extraction methods. Atlantic Poultry Conference, Wolfville, NS. Feb 13-15, 2013.
12. Beltranena, E., and M. Oryschak. *B. napus* and *B. juncea* canola meals for broilers: I. Nutrient and energy digestibility. Atlantic Poultry Conference, Wolfville, NS, Feb 13-15, 2013.
13. Beltranena, E., and M. Oryschak. *B. napus* and *B. juncea* canola meals for broilers: Effects of increasing dietary inclusion on growth performance, carcass traits, and profitability. Atlantic Poultry Conference, Wolfville, NS, Feb 13-15, 2013.
14. Beltranena, E. and M. Oryschak. Can triticale be a reliable alternative to wheat in broiler diets? Atlantic Poultry Conference, Wolfville, Nova Scotia, Feb 13-15, 2013.
15. Beltranena, E., and M. Oryschak. Could pulses give soybean meal a run for your money?: I. Soy

- vs. pulse protein concentrates for chicks. Atlantic Poultry Conference, Wolfville, Nova Scotia, Feb 13-15, 2013.
16. Beltranena, E., and M. Oryschak. Could pulses give soybean meal a run for your money?: Whole pulses vs. soybean meal for growing broilers. Atlantic Poultry Conference, Wolfville, Nova Scotia, Feb 13-15, 2013.
 17. Beltranena, E., and M. Oryschak. Can fractionation technology enhance the nutritional value of wheat DDGS for poultry? Atlantic Poultry Conference, Wolfville, Nova Scotia, Feb 13-15, 2013.
 18. Beltranena, E., and M. A. Oryschak. Camelina, another egg out of the canola basket. Invited seminar, Dept. of Animal and Poultry Sciences, University of Saskatchewan. Saskatoon, Saskatchewan. May 3, 2013.
 19. Bench, C.J. Bear Pit: Livestock Care Conference, Alberta Farm Animal Care. March 21-22, 2013.
 20. Bench, C.J. Student engagement and talking posters session. AFAC Livestock Care Conference. March 21-22, 2013.
 21. Betti, M. The alchemy of poultry: maximizing the value of meat processing by-products. Poultry Research Centre AGM. Edmonton, Alberta.
 22. Carney, V. L. PRC newsletter article. Breeder workshops. January 2013.
 23. Carney, V. L. PRC Research summary highlights for Annual report for AHEP, ACP, ATP. January 2013
 24. Carney, V. L., B. L. Schneider. Data Handling Best Management Practices Update. Presented at the Alberta Hatching Egg Producers Annual General Meeting. Red Deer, February 2013.
 25. Carney, V. L., Schneider 2013. The PRC's Role in Research Adoption. University of Alberta, Poultry Research Centre, Annual General Meeting, Edmonton, AB, May 28-29.
 26. Carney, V. L., B. L. Schneider. 2013. Proceedings for the Evening of Learning and Sharing poster presentations in conjunction with the PRC Annual General Meeting. May 2013.
 27. Carney, V. L. Role of Primary Breeders in the Poultry Industry. Presented to Animal Science 471 Class, University of Alberta. September 2013.
 28. Carney, V. L., B. L. Schneider, D. Korver. PRC Update. Presented at Alberta Chicken Producers Regional Meetings. Edmonton, Calgary, Lethbridge. October 2013.
 29. Carney, V. L., B. L. Schneider. Proven Consistent Results presented at medium egg workshops. Edmonton, Calgary, Lethbridge. 2013.
 30. Carney, V. L., B. S. Schneider. Radio interview for "Call of the Land" radio program to promote Medium Egg workshop. Edmonton. October 2013.
 31. Cho, M., K. L. Nadeau and D. R. Korver. Interaction of breeder dietary canthaxanthin and 25- OH cholecalciferol on broiler breeder production traits. Poult. Sci. 92 (E-suppl. 1):41. Poultry Science Association Annual Meeting, San Diego, CA, July 24, 2013.
 32. Cho, M., K. L. Nadeau, D. Barreda, and D. R. Korver. Parental dietary canthaxanthin and 25-hydroxycholecalciferol affect broiler performance and innate immunity. Poult. Sci. 92 (E-suppl. 1):41. 2013 Poultry Science Association Annual Meeting, San Diego, CA, July 24, 2013.
 33. DesLauriers, A. G. C.*, M. J. Zuidhof, and D. R. Korver. Effect of dietary cereal grain on different male line broiler crosses. Poult. Sci. 92 (E-suppl. 1):13. 2013 Poultry Science Association Annual Meeting, San Diego, CA, July 23, 2013.
 34. DesLauriers, A.G.C., M. J. Zuidhof, and D. R. Korver. Finding the right male line: the interaction between diet and genetic strain on broiler performance. Prairie Poultry Meeting. Saskatoon, Saskatchewan. May 8, 2013.
 35. DesLauriers, A.G.C., M. J. Zuidhof, and D. R. Korver. Finding the right match: A comparative study between male line and diet. Alberta Poultry Industry Annual meetings. Red Deer, AB. February

- 26, 2013.
36. DesLauriers*, A.G.C., M. J. Zuidhof, and D. R. Korver. Effect of dietary cereal grain on different male line broiler crosses. *Poultry Sci.* 92(Suppl. 1):13.
 37. DesLauriers*, A.G.C., M. J. Zuidhof, and F.E. Robinson. Community: In and outside the classroom. North American Colleges and Teachers of Agriculture annual meeting. Blacksburg, VA. June 25 - 29, 2013.
 38. Du L., Z. Khiari and M. Betti. Characterization of Gelatin obtained from the collagen biomass during acid-aided solubilization process of Mechanically Separated Turkey Meat (MSTM). Institute of Food Technologist Annual Meeting & Food Expo, Chicago (IL) July 13-16, 2013.
 39. Du, L. and M. Betti. Why not “Jello” from chickens? Poultry Research Centre AGM. Edmonton, Alberta. 100 participants.
 40. Geiger*, C.M.M., D. C. Penrice, C. W. Wilkinson, and Martin J. Zuidhof. Crossing Disciplinary Boundaries with Industry and University Students. North American Colleges and Teachers of Agriculture annual meeting. Blacksburg, VA. June 25 - 29, 2013.
 41. Goddard, E. Canadian Turkey Markets: Challenges and Opportunities. BC Turkey Producers Annual General Meeting. Langley, British Columbia. March 26, 2013.
 42. Goddard, E. Marketing, Consumers and Credence Attributes – Implications for Poultry Markets. Sunrise Poultry Annual Meeting. Lethbridge, Alberta. November 7, 2013.
 43. Gu, Y., Q. Li and J. Wu. Is spent hen a novel source of antihypertensive peptides? Poultry Research Centre AGM. Edmonton, Alberta.
 44. Gupta*, S., M. J. Zuidhof, G. Kachanosky, and T. Siddique. Mass balance of arsenic from poultry feed to poultry litter. Canadian Society of Soil Science. Winnipeg, MB. July 22 - 25, 2013.
 45. Hamidu, J. A., C. A. Torres, M. L. Johnson, and D. R. Korver. 2013. Incubation factors affecting embryonic development and hatch quality in Ross 308 broiler chicks. *Poult. Sci.* 92 (E-suppl. 1):31. Poultry Science Association Annual Meeting, San Diego, CA, July 24, 2013.
 46. Himcampie, D. and M. Betti. Can chicken gelatin kill bugs? Poultry Research Centre AGM. Edmonton, Alberta. May 28, 2013.
 47. Hrynets, Y. and M. Betti. Glycation of isolated muscle proteins with glucosamine: Impact on functionality. Poultry Research Centre AGM. Edmonton, Alberta. May 28, 2013.
 48. Hrynets, Y. and M. Betti. Transglutaminase catalyzed glycosylation of isolated muscle proteins with glucosamine: gel microstructure. Canadian Institute of Food Science and Technology. Alberta AGM.
 49. Jahandideh, F. and J. Wu. Can table egg reduce your body cholesterol? Poultry Research Centre AGM. Edmonton, Alberta.
 50. Jeffrey, S. R. and D. R. Korver* Medium Eggs: Economic costs Egg Farmers of Alberta Medium Egg Workshop, Edmonton, Calgary, Lethbridge October 22- 24, 2013.
 51. Khiari, Z., M. Ndagijimana and M. Betti. 2013. Low molecular weight collagen peptides from poultry collagen biomass possess antihypertensive and anti-inflammatory activities. Institute of Food Technologist Annual Meeting & Food Expo, Chicago (IL) July 13-16, 2013.
 52. Khiari, Z. and M. Betti. Meat processing dilemma: soy proteins isolates or poultry protein isolates? Poultry Research Centre AGM. Edmonton, Alberta. May 28, 2013.
 53. Khoon and M. Betti. Kokumi sensation from poultry protein: adding the ‘Oomph! Poultry Research Centre AGM. Edmonton, Alberta. May 28, 2013.
 54. Khosa, M. A.; Ullah, A*. Surface Modification, Characterization and Application of Chicken Feathers as Novel Biosorbent, 21st Bio-Environmental Polymer Society (BEPS) Annual Meeting, University of Warwick, UK. September 18, 2013.

55. Khosa, M. A^{*}; Ullah, A. Novel poultry feather filter for arsenic contaminated water, 2013 PRC Annual General Meeting, Edmonton, AB. May 28, 2013.
56. Korver, D. Skeletal Development in Layers Atlantic Poultry Conference, Greenwich, Nova Scotia February 15, 2013.
57. Korver, D. Adjusting Incubation Conditions Based on Source of Hatching Eggs Atlantic Poultry Conference, Greenwich, Nova Scotia February 15, 2013.
58. Korver, D. Skeletal Development in Layers Prairie Poultry Meeting, Saskatoon, SK May 8, 2013. Korver, D. Nutrition and Immunity: Opportunities and Unintended Consequences Multi-State Nutrition Conference, Indianapolis, IN May 23, 2013.
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 16. Wenger, I. I., and M. J. Zuidhof. Precision Broiler Breeder Feeding System. Interim report to Alberta Hatching Egg Producers. January 16, 2013. 2 pp.
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Book Chapters

1. Nimalaratne C., Lopes-Lutz D., Schieber A., Wu J. Egg Yolk Carotenoids: Composition, Analysis, and Effects of Processing on Their Stability. In Carotenoid Cleavage Products; Winterhalter P., Ebeler S.E., Eds.; ACS Symposium Series 1134; American Chemical Society: Washington, DC, 2013; pp 219-225.

Patent Applications

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Acronyms and Abbreviations Used

| | |
|-----------------|--|
| ACP | Alberta Chicken Producers |
| AFNS | Department of Agricultural, Food and Nutritional Science |
| Ag | Agriculture |
| AGM | Annual general meeting |
| AHEP | Alberta Hatching Egg Producers |
| AI-Bio | Alberta Innovates Bio-Solutions |
| ALES | Agricultural, Life and Environmental Sciences |
| ALMA | Alberta Livestock and Meat Agency |
| ARD | Alberta Agriculture and Rural Development |
| ATP | Alberta Turkey Producers |
| BW | Body weight |
| CAAP | Canadian Agricultural Adaptation Program |
| CHEP | Canadian Hatching Egg Producers |
| EFA | Egg Farmers of Alberta |
| EFC | Egg Farmers Canada |
| FGSR | Faculty of Graduate Studies and Research |
| FTE | Full time equivalent |
| GCC | Grand Challenges Canada |
| GRAF | Graduate Research Assistantship Fund |
| GSA | Graduate Student Association |
| HQP | Highly qualified personnel |
| MDLP | Market Development Leasing Program |
| MSc | Master of Science |
| MSPRU | Meat Safety/Processing Research Unit |
| NEP | New Entrant Program (EFA) |
| NSERC | National Science and Engineering Research Council |
| NSERC DG | NSERC Discovery Grant |
| NSERC RT | NSERC Research Tools and Instruments Program |
| PhD | Doctor of Philosophy |
| Post doc | Post doctoral fellow |
| PRC | The PRC |
| R&D | Research and development |
| RTE | Ready to eat |
| SAFUG | Sustainable Aviation Fuel Users Group |
| SDA | Stearodonic Acid |
| SHR | Spontaneously hypertensive rat |
| U of A | University of Alberta |
| U/G | Undergraduate student |
| VP | Vice President |
| WPC | World's Poultry Congress |