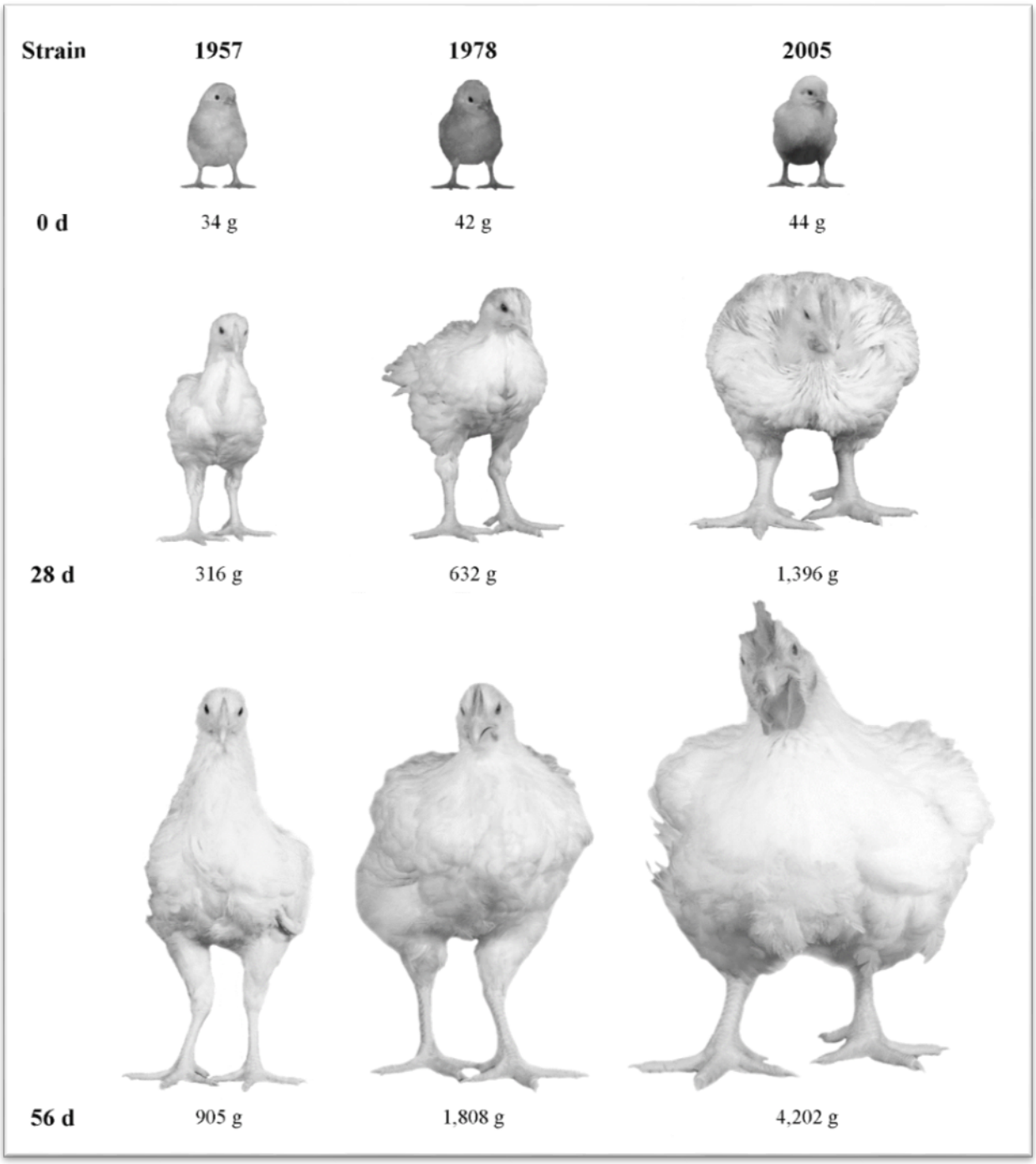
2014 Annual Report

April 1, 2014 to March 31, 2015

Poultry Research Centre

Innovation since 1986



Poultry Research Centre

Innovation since 1986

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 Cara Prout

The Poultry Research Centre (PRC) is a unique partnership between the Poultry Industry (broiler, table egg, hatching egg and turkey), the Provincial Government and the University of Alberta. Together through the structure of an Advisory Board, this multi-facet group works through the PRC to develop and deliver sustainable innovations through excellence in research, teaching and technology adoption. As my first year as Chair of the Advisory Board, I am excited to watch the group develop and plan for continued future success.

2014 has been a busy year for the PRC; on-top of celebrating the year's accomplishments highlighted in the 2014 annual report, the Advisory Board has spent much time refining and defining their governance model and planning for the future. In 2014, the Advisory Board updated and adopted a policy manual, reviewed key research areas and projects underway and spent time thinking through future priority areas for the PRC. A strategic planning retreat has been planned for April, 2015 whereby the Board will explore the 10 to 15 year vision for the PRC.

The Centre continues to attract enthusiastic and talented students to the agricultural sector; students highlighted their accomplishments through their undergraduate student presentations at the Board's November, 2014 business meeting. Student development continues to be a valuable link the PRC brings to the poultry industry as a whole.

Academic Leader's Report

Submitted by Martin Zuidhof

Thanks to the support and participation of our partners, 2014 has been another productive year in research, teaching, extension, and planning. I am very proud to represent the Poultry Research Centre, and the excellent students, technical and administrative staff, partners, teachers, and researchers. The spirit of cooperation and innovation is alive, and we are in the process of planning a strategic direction that will ensure this remains the case. Officially, the PRC now includes industry staff contributing in kind toward the shared goals of our partners. This structural change is critical for industry driven technology transfer by way of the PRC.

In research, we have benefited from exciting and collaborations within and beyond the PRC partners. This year we made progress in over 40 active projects on topics in the fields of Food Safety, Production Systems, Nutrition and Physiology, and Meat and Egg Processing and products. With new precision feeding technology we have achieved unprecedented levels of breeder flock uniformity, with the aim of commercializing this automation. We have developed techniques that can be used to make poultry

products safer and healthier, and to monetize byproducts of the poultry industry. Research and commercialization efforts on egg peptides commercialization continued to be a strong focus.

We have had continued success in teaching and education. We supervised 43 graduate students on poultry related projects, saw 3 MSc students and 2 PhD student graduate, and earned still more teaching awards. Over a dozen 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 several have found poultry related jobs through the club. These are fantastic people, and they are the future leaders of the poultry industry.

The PRC received an award for making community connections. Our "Adopt a Heritage Hen" program and new partnership with Peavey Mart has meant that the heritage lines we maintain are now self-sustaining. There have been bumps in the road to this point, and I want thank our industry partners for participating in the program. I also want to assure you that we are committed to dispelling myths about poultry and egg production in an authentic and factual manner, according to the University of Alberta's motto "*Quaecumque vera*" (whatsoever things are true).

Through the strategic planning process, I have been encouraged by many great accomplishments identified through a strategic planning retreat, and interviews with stakeholders and clients of the PRC. It is clear that many things are working well. Many challenges remain ahead for us, and I look forward to working with you to ensure the structure and operations of the PRC reflect what needs to be accomplished.

I've long been thinking about what the PRC is. There are many metaphors:

- Is it a just research station? Thinking about the PRC in this way certainly constrains the potential of the knowledge and technology generated there.
- Is it live theatre? Do you pay to get in and simply watch and perhaps critique the story line?
- Is it a store? Certainly, the PRC produces knowledge "products", including research reports, peer reviewed research articles, and meetings designed to extend and apply the knowledge gained. Another important product is highly qualified personnel, many of whom become leaders in industry.
- Is the PRC a school? Certainly, you as a stakeholder contribute to poultry education and extension in some way.
- Is the PRC a hospital? When something is wrong, do you seek treatment for a problem?
- Is it a community, and working together toward common, yet diverse goals?

None of these tells the whole story. I'm confident that the current strategic planning process will at least begin to cast light on the PRC's nature, and illuminate many next steps.

As academic leader of the Poultry Research Centre, I encourage you to read about your own achievements, our collective achievements, and to think about how your involvement in the PRC will enhance your success. Thanks for your support and engagement!

Technology Transfer Highlights

Submitted by Val Carney

In the past year, the PRC organized and participated in a number of events to support knowledge and technology transfer with industry.

1st Western Poultry Conference, Red Deer, Alberta. February 2014 (Attendance: 320)
Developed and organized poultry conference aimed at producers. Program included experts providing practical and applicable information on transportation, gut health, lighting, water quality and husbandry. To facilitate producer to producer uptake innovative and successful producers gave presentations: Preparing your birds for transport, Probiotics on farm, Husbandry with Aviaries. Audience polling technology was used to engage and reinforce concepts with audience. Questions were submitted using a full QWERTY keyboard to enable effective use of question period. Many questions were submitted per speaker (more than time would allow). Submitted questions will be used to develop further resources. The event was recorded and short youtube videos will be produced to support uptake of information.

Student Research Poster Session, Red Deer, Alberta. February 2014 (Attendance: ~700)
This event is held annually as part of the Alberta Poultry Industry Annual General Meetings, Red Deer, February 2014. Each poster is edited according to the audience learning needs and then printed for handouts. This event occurs by the request of the Alberta poultry industry. This is was the 5th similar event.

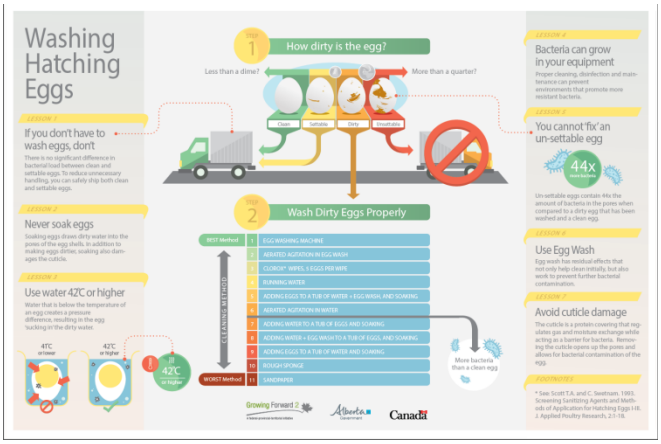
Flock Talk – Nutrition, Edmonton, Alberta. October 2014 (Attendance: 42)
Facilitated discussion were designed to facilitate producer to producer and producer to subject matter expert exchange and learning. Loosely formatted like speed dating in that the experts moved from table to table at designated times. Discussion at each table was about 30 minutes with 8 – 10 attendees per table. 100% of respondents rated the event as good to excellent with 57% indicating that they would be implementing new practices as a result of what they had learned in the discussion.

Poultry Research Centre Open House – The Science Behind the Hen House Doors, Edmonton, Alberta. May 2014 (Attendance: ~ 130)
This event included researcher presentation session and student poster session in conjunction with the Poultry Research Centre Annual General Meeting. 42 student posters to reach producer and public audience were displayed. Each poster included a handout for attendees. This event fosters discussion between students, producers and allied industry members to the betterment of developing applicable and practical research that supports innovation adoption.

Enhanced Stewardship and Responsible Antibiotic Use in the Poultry Supply Chain – What, When, Why and How Will I Be Prepared. Red Deer, Alberta. April 2013 (Attendance: 123)

This event was held in collaboration with the Alberta Chicken Producers Research Committee. Each of the presentations and questions were recorded and transcribed. This information was used to develop an responsible antibiotic use manual for the Alberta Chicken Producers. This manual is expexted to be published April 15, 2015 and includes 60 pages of material.

On-Farm Hatching Egg Producer Consultations May 2014 (3 farms).
On-farm consultation with hatching egg producers was conducted to evaluate egg handling systems using the Crackless egg to assess shocks and bumps causing cracks in eggs. These assessments enabled identification of locations on the egg handling system that are prone to causing cracks. Subsequently, producers have modified their systems to reduce the number of cracked eggs. There has been much debate in Alberta about the suitability of washing hatching eggs. Due to the supply managed nature of the province, there is some interest in this practice. Research had shown that washing dirty hatching eggs could be beneficial. This project surveyed the current practices in Alberta and a study was conducted to demonstrate the best practices. The response to the findings of this study was very positive. Within 2 days there were enthusiastic, anecdotal reports from two farms indicating that as a result of what they had learned from this project they immediately changed their practices. 88% of respondents (50% response rate) indicated they would use the information and materials from the study to train their staff. Following a presentation of this information to the industry the team was subsequently asked to produce an in-barn resource. They developed a water resistant poster summarizing the top 7 best management practices. Subsequently they were invited to present the results of the egg washing study to the Alberta Chick Quality committee which includes representatives from the Alberta Chicken Producers, the Alberta Hatching Egg Producers and the Alberta Hatchery Association.



Highlights: Education, Training & Retention of Highly Qualified People

Submitted by Doug Korver

PRC team members are an important part of the graduate and undergraduate teaching program at the University of Alberta. Our faculty teach courses at the graduate and undergraduate level. Although there are few poultry-specific courses (ANSC 471 – Applied Poultry Science and ANSC 463 – Poultry Nutrition), our faculty teach introductory and upper-year courses that often have poultry-relevant material included. The opportunity to teach at the introductory level ensures that students interested (or who become interested) in poultry are steered towards appropriate upper-level poultry courses. Courses cover such topics as poultry management, nutrition, metabolism, welfare, behaviour, products, food safety and food product development. In addition to teaching at the University of Alberta, members of the PRC also deliver lecture content and practical experience to students at the University of Calgary faculty of Veterinary Medicine. In 2014, three of our faculty – Clover Bench, Lynn McMullen and Martin Zuidhof were awarded Faculty of Agricultural, Life and Environmental Sciences "Teacher of the Year" honours.

In addition to undergraduate and graduate teaching, training of highly qualified personnel (HQP) remains an important focus for the PRC. In 2015, PRC faculty supervised approximately 40 graduate students, 6 visiting scholars, 17 research technicians, 6 Research Associates, 8 post-doctoral fellows, and 5 undergraduate research assistants. Our students won presentation awards at international scientific meetings, as well as numerous scholarships.

As in previous years, members of the PRC (including technicians, researchers, extension specialists and students) were on hand for the 2015 poultry industry Annual General Meetings held in Red Deer. A large number of posters highlighting student and other projects were displayed, giving our students and staff opportunities to meet directly with producers and talk about the exciting work being done at the PRC, and the relevance of that work to the Poultry industry in Alberta.

The Poultry Research Centre Student Club was active again this year, and organized a number of social and educational events, and participated in work experience on Alberta commercial poultry operations. Now in its third year of operation, the PRCSC continues to be an excellent opportunity for University of Alberta students to gain experience in poultry handling, poultry science and the poultry industry.

Business Development Highlights

Submitted by Agnes Kulinski

It has been another busy and exciting year of business development at the PRC. We have been very fortunate to collaborate with the industry, government and local community to generate new revenue streams and contribute to a sustainable PRC. Undoubtedly, the PRC has a combination of knowledge, capabilities, and infrastructure creating an innovative, cutting-edge environment for successful business development. Here are some of our current business development activities.

Commercialization of egg peptides:
Commercialization of egg peptides developed by Dr. Wu continues to be a strong focus. To support the initial commercialization stages, ALMA provided funds to complete feasibility studies, and based on these positive results, we have developed a roadmap to commercialization of egg peptides as Natural Health Products. We will continue to develop these technologies with the help of Afinity Life Sciences, TecEdmoton, EFA and ALMA. The next steps include clinical trials, egg peptides production scale-up and regulatory approvals in Natural Health Product area.

Nutritional Product Development Capstone course:
I had a pleasure to be involved in Dr. Betti's Product Development course this past year. The course teaches product development principles with focus on recent trends in food science and emerging innovative technologies. It is a great opportunity to teach and inspire entrepreneurship in students. We identified and collaborated with local businesses such as BioNutra, Progressive, Beary Berry Honey, Mountain Meadows and Sunny Boy Foods which presented project ideas to students. Students developed exceptional food products including Sausage with Addition of Beta-glucan, Meat Marinade with Potassium Chloride Salt to Reduce the Sodium Levels, the Canadian Honey Square prepared by a dehydration process and Pulscotti Cookie Butter which incorporates chickpea flour.

A story focused on the product development efforts of the students will be soon published in the Tomato Magazine. We anticipate the published article will create greater interest from the local businesses and in turn generate further product development opportunities for our students.

The Heritage Chicken Project:
The Adopt a Heritage Chicken Program continues to be a highly successful program to support genetic preservation. Amber Dobson, our Heritage Chicken Program Coordinator, takes the lead on planning and coordinating new initiatives. The PRC is working on the development of a poultry genetics grogram in collaboration with Livestock Gentec and the Genomics group at the UofA. In this research program we will characterize and compare the genetic diversity of the heritage strains to commercial lines, and develop a breeding strategy that selects for economic and production traits, while maintaining genetic diversity within the poultry breeds. To raise additional funds for the breeding program, we developed a marketing plan to sell heritage chicks through Peavey Mart, a Western Canadian owned company that sells agriculture and hardware supplies.

Agriculture and Rural Development – Government of Alberta

Submitted by Wesley Johnson

Greetings from Alberta Agriculture and Rural Development, Livestock Research and Extension Division. The 2014-15 year was another successful period for poultry research and extension activities. Some of the newly funded projects were: *Poultry Skills and Knowledge Development - Western Poultry Conference and Poultry Roundtable Series*; *Knowledge dissemination and demonstrations to support prudent antibiotic use in the chicken supply chain* (Developed and worked on Val Carney, Brenda Schneider, Jessica Josephson); and *Camelina sativa cake as a feedstuff to enrich table eggs with omega-3 fatty acids and tocopherols (* Developed and worked on *by* Eduardo Beltranena, Matt Oryschak*)*

The 1st Western Poultry Conference was an incredible event with provincial and international speakers on a variety of topics relating to poultry transportation, husbandry, barn lighting, gut health and water quality. With attendance of 320 individuals, audience polling technology was used to engage and reinforce concepts with audience. Questions were submitted using a full QWERTY keyboard to enable effective use of question period. Many questions were submitted per speaker (more than time would allow). Submitted questions will be used to develop further resources. The event was recorded and short youtube videos will be produced to support uptake of information.

Another project ARD was involved with was to test Low Atmospheric Pressure Stunning for depopulation of poultry in Alberta. This was initiated in collaboration with Alberta Hatching Egg Producers, Alberta Egg Producers, Poultry Health Services and the Institute for Applied Poultry Technologies. Equipment has been delivered and first on farm test completed, cleaning and disinfection SOP's developed. As a result of testing, new cages were necessary. The team has worked to design and have cages manufactured to specifications. They have been delivered and new farm testing is scheduled for April and May 2015.

The feed trials we are leading in are in process and scheduled for completion in the next 1-2 years and subsequent knowledge transfer. There are many more extension activities planned for in 2015-16 and we look forward to collaborating with the poultry Industry.

Alberta Chicken Producers

Submitted by Karen Kirkwood

Alberta Chicken Producers is a major partner in the Poultry Research Centre 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:

- Collaboration of the Alberta Poultry Industry and Alberta Government in hosting a highly successful inaugural Western Poultry Conference in February 2015;
- Implementation of a chicken sector-wide strategy to eliminate the preventative use of category I antimicrobials as of May 2014;
- Development of proceedings and best practices resources for producers to integrate key learnings from the 2014 Antimicrobial Use Symposium.
- Mandatory compliance of all registered chicken producers in Alberta with stocking density and flock management requirements of the Animal Care Program;
- Ongoing analysis and reporting from the Ammonia and Humidity Baseline Study conducted in Alberta's broiler barns, which will further support and enhance the delivery of the Animal Care Program; and
- Projects that support improvements in broiler chick quality and brooding practices.

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

1. Use of Antibiotics and Alternative Strategies
2. Animal Welfare
3. Food Safety
4. Uniformity and quality of live birds and product
5. 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 sustainability of the Alberta turkey industry.

Our vision is a strong, stable and sustainable turkey industry committed to constantly improving product quality and building consumer confidence. Throughout 2014, the Alberta Turkey Producers implemented initiatives and worked on activities that were directly in-line with our vision.

Throughout 2014, Alberta Turkey Producers successfully maintained 100% compliance on the Turkey Farmers of Canada's On-Farm Food Safety Program. Throughout the year, the Board of Directors encouraged membership to implement the Turkey Farmers of Canada's Flock Care Program by providing on-farm coaching sessions for interested membership. All members received coaching on the program throughout the year, as such; the Board is currently in a position to make the Flock Care Program mandatory. Mandatory implementation will be drafted into ATP's provincial regulations to be effective December 31st, 2015.

ATP spent much of 2014 developing and implementing an Alberta based pricing model for the setting of Alberta's live price. The model was developed in conjunction with Alberta federally inspected processors and is based off of Alberta production costs.

ATP enjoyed a unique engagement with University of Alberta students involved in the Poultry Club in 2014. Students were invited to attend ATP's annual fall grower's meeting and Christmas dinner to network with turkey producers and learn about the turkey industry. Students provided producers with 'entertainment' for the evening consisting of student talks/presentations on their interest in the poultry industry and agricultural sector and presented on agricultural awareness work done through the U of A. Students also shared some work done through the U of A's There's a Heifer in Your Tank initiative where songs and videos related to the turkey industry were shared.

ATP continues to value the collaboration between industry and research and continues to value the investment in students. ATP looks forward to participating in the PRC's strategic planning session in preparation for guiding the Centre's direction into the years ahead.

Burnbrae Farms

Submitted by Helen Anne Hudson

Burnbrae Farms Ltd is a family owned and operated company that has been producing eggs for over 70 years. Burnbrae Farms is one of Canada's leading egg producers. With farms in Quebec, Ontario, Manitoba and Alberta, it is a thriving participant in agribusiness.

Burnbrae Farms sells eggs and egg products in major grocery store chains, food service operations and large bakery and industrial customers throughout Canada. The Company has grading stations across the country in Quebec, Ontario, Manitoba, Alberta and British Columbia servicing all major retail chain nationally with the exception of Atlantic Canada. Processing operations are in Quebec, Ontario and Manitoba.

At Burnbrae Farms we recognize that research and innovation are crucial to our industry. We have actively supported and continue to support several universities in Canada including the Poultry Research Centre in Alberta. Animal Welfare continues to be a top research priority including housing systems for laying hens in Canada and globally. Multiple animal activist events in the past two years underpin the need to support research in animal husbandry, care, handling including euthanasia, transport and housing and to educate consumers about agriculture. All research and study programs should include animal husbandry training. Good animal husbandry and welfare are key to consumer confidence (and our social licence to produce our products). Other important priorities include further uses of eggs and spent hens which will only help our industry to be more sustainable.

This year I attended the PRC AGM as a board member 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. At Burnbrae Farms, we are proud to support the PRC. The scientists and staff 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

Over the past year, EFA has had the fortune of continued successful collaboration with staff and researchers at the PRC.

We would like to acknowledge the success of the PRC's Heritage Chicken Project. The Project has met the need of covering off the costs associated with maintaining these hens at the PRC and had generated a lot of positive publicity. The PRC has extended effort to work with industry to ensure that food safety and animal care requirements are met within this research setting. In the future, we believe that the establishment of a Heritage Chicken Program Steering Committee will help to ensure that poultry genetic preservation efforts continue at the PRC in a manner consistent with the needs of PRC stakeholders and ensure two way consultation and communication between the Heritage Chicken Program Coordinators, the PRC Advisory Board, and the relevant poultry industry stakeholders.

As EFA continues to work toward improving the carbon footprint of egg production in Alberta, a new area of focus is emerging in feed efficiency and nutrition. Experts on poultry feeding at the PRC have volunteered their expertise to help EFA evaluate opportunities in this area, and begin to communicate ideas. In addition, in the wake of the A&W campaign advertising eggs from "hens fed a vegetarian diet" EFA relied on their support to help address numbered and detailed questions about feed rations in the layer industry.

In 2014, EFA was able to coordinate Welfare Quality Assessment (WQA) training for staff, board members, and industry leaders that provided tremendous insight into outcome based measures for flock animal care. Working with the PRC to piggyback on such an opportunity was a great example of the synergism that results from working together closely. The ongoing on-farm research that will compare WQA results with physical measurements of welfare will provide valuable information to our industry and producers.

Further away from the farm, we are excited at new interest being generated in previously patented value-added egg technologies. We believe that many years of research investment are beginning to move research closer to commercialization and we are excited for the opportunity to help support the new studies that will be needed to build upon this success.

Thanks to all at the PRC for all that you do – it is great working with you!

Egg Farmers of Canada

Submitted by Karen Diepeveen, Research and Knowledge Mobilization Officer

EFC was delighted to join PRC's Advisory Board in 2014, which has already resulted in a stronger relationship. In July, EFC's Research Committee held their summer meeting in Edmonton and were treated to a tour of PRC's facilities. All members of the Research Committee were very pleased with the opportunity to see the PRC birds, barns and labs, and they held very productive and informative conversations with the PRC's researchers and staff.

Throughout 2014, EFC continued to move forward on several other research initiatives. In the fall, we announced our Research Chair in Public Policy, Bruce Muirhead (University of Waterloo). Dr. Muirhead's work focuses on food policy and the current challenges surrounding egg production. He is also exploring the historical and international realities that have shaped and informed existing food policies, and analyzing the sustainability and resiliency of supply management across the decades and its merits as a rational and necessary policy.

Research priorities remained the same over 2014, with funded research projects aligning with one or more of EFC's priorities:

- Animal care science related to housing systems
- Animal welfare emerging issues
- Food safety
- Human health benefits of eggs
- Identifying non-food uses of eggs
- Environmental research
- Use of antimicrobials in feed
- Support for supply management

EFC's Research Committee also approved a new process for requesting and accepting letters of intent from researchers across the country. Under the new system, EFC will issue two calls for proposals each year, in January and in July. Following these calls, researchers will be notified if they are invited to submit a full proposal.

EFC looks forward to continuing to build important connections with the PRC researchers, staff and stakeholders, and to communicating the PRC's leading research with our farmers across the country.

Awards

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

Faculty Awards

Faculty	Award
Clover Bench	ALES Teacher of the Year
Martin Zuidhof	Teaching Wall of Fame, Faculty of Agricultural, Life and Environmental Sciences

Graduate Student Awards

Student	Award
Ali Akbari	AFNS Winter Differential Award
Chamila Nimalaratne	AFNS Graduate Research Assistantship Fund Tuition Award
Jiandong Ren	AFNS Winter Differential Award
Kausatv Majumder	Mary Louise Imrie Graduate Student Award
Kaustav Majumder and Qiyi Li	2nd Place Winners of the Poultry Research Center Annual General Meeting Poster Competition
Misaki Cho	Poultry Science Association Graduate Student Award of Excellence
Nandika Bandara	First place award of the Poultry Research Centre Annual General Meeting Poster Competition
Nandika Bandara	AFNS Graduate Research Assistantship Fund Tuition Award
Juan You	2nd place of International Division in IFT-2013 George Stewart Graduate Paper Competition.
Juan You	Receipt of China Scholarship Council
Zheng Li	Receipt of China Scholarship Council

Community Awards

Program	Award
Adopt a Hen Heritage Chicken Program	University of Alberta Community Connections Award – Community Leader

Graduations

Congratulations to the following students who earned their degrees in the current year 2014-2015.

Graduate	Supervisor	Degree
1. Christine (Xiaoji) Liu	McMullen	PhD
2. Carlos Lozano	Zuidhof	MSc
3. Kavstav Majumder	Wu	PhD
4. Sogol Teflisi	Wismer	MSc
5. Wujun Zhao	Ullah	MSc

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 in poultry research, Dr. Beltranena and his team contribute presentations, posters and reports. He collaborates with Dr. Mirko Betti, Dr. Doug Korver and Dr. Wendy Wismer. Dr. Beltanena participates in Sandeep Nain's PhD Candidacy Committee. ARD has contributed to the PRC's facilities and equipment requests and in the past year provided funding for the upgrade to the egg cooler room.

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 were obtained and enabled Dr. Betti to continue 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

Dr. Korver's research program allows him to reach a large number of undergraduate students, giving them a strong basis in animal nutrition in general, and poultry nutrition specifically. He taught two courses with a combined total of 85 students, as well as a 3-hour lecture on poultry nutrition at the University of Calgary College of Veterinary Medicine. Dr. Korver also supervised an ANSC 499 Capstone project (4 students) and an undergraduate student in an independent study project (ANSC 400).

Dr. Korver published 2 papers in peer-reviewed poultry journals, and had 7 presentations at scientific meetings (4 of which were presented by his graduate students). He supervises 3 M. Sc. Students and 3 Ph. D. students.

Dr. Korver made scientific and industry presentations in 7 countries and continues to develop his international reputation as a scientific and poultry industry conference speaker. He led 2 poultry research projects in Colombia, and is working on developing a project in Ecuador. His extensive international speaking engagements bring value to the PRC by increasing international exposure, and allowing him to recruit excellent international students.

Lynn McMullen

Work on antimicrobials that could be applied to poultry products has continued. Bacteriocins (antimicrobial peptides) of lactic acid bacteria could be used to inhibit or kill *Listeria monocytogenes* on processed poultry products. Other antimicrobials and technologies, such as high pressure processing, have also been investigated with an aim to improve the safety and quality of poultry products. Our work on low salt meat products, including poultry, has demonstrated that removal of salt does not increase the risk of growth of *L. monocytogenes* as long as the endogenous microbiota is present.

Aman Ullah

Dr. Ullah research program is currently working on 4 research projects and one patent application. His team is growing with 4 graduate students and 5 personnel. Dr. Ullah has received 3 new grants this year including NSERC Discovery and NSERC CRD grants. In the past year, Dr. Ullah supervised 4 students at the University of Alberta and co-supervised 2 students outside the University of Alberta. Dr. Ullah's program is attracting new graduate students with 4 starting in 2015.

In 2014, Dr. Ullah was an organizing member of the National Scientific Committee and also chaired a session for 13th International Symposium on Bioplastics, Biocomposites & Biorefining: Moving towards a Sustainable Bioeconomy. He also sits on the ALES Scholarship Ranking Committee and the Academic Appeals Committee. He served as an editorial board member for journals and orked with the Ontario Ministry of Agriculture, Food and Rural Affairs to review a grant application.

Wendy Wismer

Dr. Wismer's contribution to the PRC consists of a cooperative research study between her research team and Dr. Eduardo Beltranena and Matt Oryschak of Alberta Agriculture and Rural Development. A graduate student from This year, Dr. Wismer's research program performed consumer sensory assessments on eggs from hens based on specialized diets developed by the researchers at AARD.

Jianping Wu

Dr. Wu taught one undergraduate course NUFS 200 (100%), one capstone course with SR (20%) NUFS 490 with additional 4.5 h seminar contact hours, two guest lectures, one undergraduate research project. He supervised 14 graduate students (3 co-supervised, 1 PhD student successfully defended), 2 summer students, 3 PDF (2 completed), 1 research associate, 1 technician, and 1 visiting professor. 21 awards of various kinds for the students.

Dr. Wu published 17 peer-reviewed papers, 2 accepted/in press, 7 submitted, 1 book chapter published, 17 conference presentation (5 invited), 6 various grant repots, 7 new grants awarded over $1M, 6 new grants submitted (2 as PI), $633 K received as PI in 2014 out of total $1.633 M..

Dr. Wu is a member of the Animal Care and Use Committee - Livestock (ACUCL), PRC Board of Directors, Editorial Board of one SCI journal. He was part of the organizing committee for the Banff Egg Forum in

Poland and attended a joint food for health workshop and renewed adjunct professorship at Zhejiang University. Dr. Wu is actively engaged commercialization activities and has been invited as a advisory member for an international egg company.

Martin Zuidhof

Dr. Zuidhof had a very successful year in teaching, research and service. He had many highlights this year. One occurred after his presentation on precision feeding at the Arkansas Nutrition Conference: "That was the best breeder talk I have ever heard!" -- Dr. Mike Kidd (Head, Arkansas Poultry Science Department). Dr. Zuidhof's team's work on precision feeding is being recognized as a groundbreaking innovation with excellent potential for better understanding broiler breeders, for increasing their meal frequency, for increasing productivity, and for revolutionizing the way research can be designed and data collected in free run poultry experiments.

Dr. Zuidhof's graduate and undergraduate students experience hands-on learning and are provided with opportunities to connect with the public about how livestock and poultry are produced. They have also been provided with networking opportunities with poultry and scientific professionals.

Dr. Zuidhof is proud of his service to the scientific community, and providing solid leadership for the Poultry Research Centre. His program has increasingly provided opportunities to be an ambassador for the faculty and for sustainable and ethical food production.

Organizational Structure

Board

Board Member	Organization	Term end date
Cara Prout, Chair	Alberta Turkey Producers	2017
Wes Johnson, Vice Chair	Government of Alberta	2017
Martin Zuidhof, Academic Leader	University of Alberta	2017
Helen Anne Hudson	Burnbrae Farms	2016
Erasmus Okine	University of Alberta	2015
Jianping Wu, ex-officio	University of Alberta	2015
Susan Novak	Alberta Livestock and Meat Agency	2016
Karen Kirkwood	Alberta Chicken Producers	2015
Jenna Griffin	Egg Farmers of Alberta	2016
Karen Diepeveen	Egg Farmers of Canada	2017
Ashley Rietveld	Alberta Hatching Egg Producers	2016
Sunny Mak	Sofina Foods	2016
Tim Nelson	Independent	2015
Reg Cliche	Maple Leaf Foods	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
Trevor Prout	Alberta Chicken Producers	Technology Transfer
Robert Renema	Alberta Chicken Producers	Technology Transfer

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	Behaviour and welfare	1.5						
Mirko Betti	Associate Professor	Chemistry/ Biochemistry of muscle foods	9				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	6			1		1	
Lynn McMullen	Professor (10%)	Food microbiology	2			3	2		
Aman Ullah	Assistant Professor	Poultry by-products	6						
Wendy Wismer	Associate Professor (10%)	Sensory and consumer science	1						
Jianping Wu	Associate Professor	High value egg utilization	12			2		1	
Martin Zuidhof	Associate Professor	Poultry systems	4.5			1			1
			42	**0**	**0**	**10**	**4**	**5**	**1**

[1]Students co-supervised by two PRC researchers are counted as 0. 5

Graduate Students

Graduate Student	Supervisor	Degree
1. **Teryn Gilmet**	Bench/Zuidhof	MSc
2. **Jesse Hunter**	Bench	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. **Christine (Xiaoji) Liu**	McMullen	PhD
19. **Danielle Robocon**	McMullen	MSc
20. **R. Ahmadi**	Ullah	MSc
21. **L. Jin**	Ullah	MSc
22. **R. Kaur**	Ullah	MSc
23. **M. Safder**	Ullah	PhD
24. **Wujun Zhao**	Ullah	PhD
25. **M. Zubair**	Ullah	MSc
26. **Sogol Teflsi**	Wismer	MSc
27. **Ali Akbari**	Wu	PhD
28. **Nandika Bandara**	Wu	PhD
29. **Yussef Esparza**	Wu and Ullah	PhD
30. **Yuchen Gu**	Wu	PhD
31. **Forough Jahandideh**	Wu	MSc
32. **Chamila Koushalya Nimalaratne**	Wu and Schieber	PhD
33. **Qiyi Li**	Wu	MSc
34. **Kavstav Majumder**	Wu	PhD

Graduate Student	Supervisor	Degree
35. Jiandong Ren	Wu	PhD
36. Nan Shang	Wu	MSc
37. Xiaohong Sun	Wu	PhD
38. Liao Wang	Wu	MSc
39. Wenlin Yu	Wu	PhD
40. Paulo Carneiro	Zuidhof	PhD
41. Airell DesLauriers	Zuidhof	MSc
42. Sheila Hadinia	Zuidhof	PhD
43. Carlos Lozano	Zuidhof	MSc

Visiting Students and Scholars

Name	Program	Team
1. Mohammad Jalal	Visiting Scholar (University of Jordon)	Zuidhof

Technical Support

Name	Title	Team
1. Ken Fahner	MSPRU Manager	McMullen
2. Jessica Josephson	Research Technician	Carney
3. Ross Lowe	Research Technician	McMullen
4. Kerry Nadeau	Research Technician	Korver
5. Marina Offengenden	Research Technician	Wu
6. Sareh Panahi	Research Technician	Wu
7. Lea Swan	Research Technician	Beltranena
8. Zahra Dehghani	Research Assistant	Beltranena
9. Patrick Ward	Research Technician	McMullen
10. Theresa Liddell	Research Technician	Zuidhof

Post-Doctoral Fellows

Name	Team	Subject
1. Abhishek Bhattacharjee	Betti	Cell culture and glycation
2. Zied Khiari	Betti	Valorization of Poultry processing by-products
3. Petr Miller	McMullen	Food microbiology
4. 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

Research Projects ($3,557,359)

Research Projects					$3,557,359
Bacteriology / Food Safety					**$324,500**
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	2012-2017	$155,000
NSERC CRD/Griffith Laboratories	Discovery and Structure Activity of Bacteriocins	$50,000	Vederas and L. McMullen	2011-2014	$300,000
ALMA/AI-BIO	Impact of high pressures on L. monocytogenes	$0	L. McMullen, Gänzle	2013-2016	$276,725
ALMA/AI-BIO	Safety of low salt meats	$91,500	L. McMullen, Shand, Korber	2010-2014	$520,375
ALMA	Targeted design of novel pathogen intervention on meat	$152,000	M. Betti and L. McMullen	2013-2016	$300,000
Feed and Nutrition					**$1,009,953**
Granting Body	**Abbreviated Title**	**Amount received in current year**	**Applicant(s)**	**Planned Duration**	**Total value of grant**
DSM Nutritional Products	Dietary 25-OH Vitamin D3 and broiler immune and muscle gene expression	$0	D. Korver, C. Kitzsimmons and M. Zuidhof	2012-2014	$246,517
ALMA	Establishing a Production System for Long-Chain-w-3 PUFA Enrichment of Table Eggs Using a Novel High-Stearidonic Acid Flax	$85,225	D. Korver and M. Betti	2013-2015	$94,964

AB Vista	Layer Phytase II	$50,000	D. Korver	2013-2014	$50,000
DuPont (Danisco Animal Nutrition)	Phytase in Laying Hen and Broiler Diets - Student Project	$122,342	D. Korver	2014-2015	$112,342
DuPont (Danisco Animal Nutrition)	Phytase in Laying Hen and Broiler Diets - Proprietary	$566,663	D. Korver	2014-2015	$56,663
AB Vista	Pullet Phytase	$47,962	D. Korver	2014-2015	$47,962
ALMA/ Egg Farmers of Alberta	Prebiotics in Laying Hen Diets	$21,140	D. Korver, S. Ricke (Univeristy of Arkansas)	2013-2014	$120,140
Agriculture Development Fund, Saskatchewan	Safety and efficacy of feeding camelina meal to egg laying hens	$81,773	E. Beltranena, C. Christensen, T. Scott, A. van Kessel	2012-2014	$383,830
ALMA/CRPC	SDA Flax in Laying Hen Diets	$31,739	D. Korver, R., Weselake, R., Renema, M., Betti, M. Zuidhof	2013-2015	$119,964
Diamond V Mills	Yeast Extracts and Broiler Health	$3,109	D. Korver	2013-2014	$35,211

Management and Physiology					**$377,932**
Granting Body	**Abbreviated Title**	**Amount received in current year**	**Applicant(s)**	**Planned Duration**	**Total value of grant**

ALMA/Egg Farmers of Alberta	Commercial housing type and layer welfare and bone health	$97,700	C. Bench and D. Korver	2014-2016	$108,000
ALMA/ACP	Footpad quality in commercial broilers	$124,391	C. Bench, D. Korver, and T. Crowe	2014-2016	$145,832
AAFC Poultry Cluster/ CPRC	Improving foot pad quality in commercial broilers: Assessment of on-farm moisture management and foot pad scoring methods	$41,541	C. Bench, D. Korver, and T. Crowe	2014-2016	$113,046
ALMA	A novel antibody based veterinary biologic for the prevention of chicken osteoporosis	$114,300	H. Sunwoo, D. Korver, C. Bench and M. Doschak	2012-2015	$411,300

Meat and Eggs Products and Processing					**$1,477,474**
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	J. Wu and S. Jacobs	2010-2014	$439,757
Egg Farmers of Canada (EFC)/ Poultry Industry Poultry Industry Council/ NSERC CRD/Burnbrae Farms Ltd.	Antioxidants in Laying Hen Eggs	$117,013	J. Wu	2013-2016	$315,520

Canadian Poultry Research Council/ALMA	Biopolymer Nanocomposites for packaging applications	$65,700	A. Ullah, J. Wu, F. Temelli, and T. Siddique	2013	$210,000
Agriculture Funding Consortium Council/Canadian Poultry Research Council	Biopolymer-based nanocomposites from poultry byproducts for packaging applications	$70,000	A. Ullah, J. Wu, F. Temelli, and T. Siddique	2013-2016	$150,000 (ALMA) $60,000 (CPRC)
NSERC CRD	Biopolymer Nanocomposites for packaging applications	$12,675	A. Ullah, J. Wu, F. Temelli and T. Siddique	2014-2017	$72,015
ALMA	Commercialization of egg peptide technologies - feasibility study	$18,000	J. Wu	2014-2015	$18,000
Alberta Livestock Meat Agency, Ltd. (ALMA) and Egg Farmers of Alberta	Development of infant formula from ovomucin	$70,400	J. Wu, C. Field, an M. Ganezle	2013-2014	$105,600
ALMA	Enzymatic modification of egg lecithin and canola lecithin for functional food development	$71,500	J. Curtis, C. Field, R. Jacob and J. Wu	2014-2016	$143,000
NSERC DG	Exploring the "Meat Factor": enhancement of non-heme iron bioavailability	$26,000	M. Betti	2014-2019	$130,000
Agriculture and Agri-Food Council (CAAP program)	Functional egg bioactive peptides: scale-up processing and in vivo efficacy	$115,805	J. Wu, S. Davidge and S. Jacobs	2011-2014	$354,315

ALMA /AIBio/ACP/Maple Leaf	Functional ingredients from poultry bone biomass: extraction, isolation and purification of chondroitin sulfate	$75,000	M. Betti and Z. Pietraski	2012-2015	$225,000
ALMA/ACP	Functionalized peptides for skin care prodcued from bovine and poultry collagen biomass	$67,666	M. Betti, M. Ndagijimana, and K. Sato	2013-2016	$203,000
NSERC DG	Fundamental understanding on nanomodifications of keratin biopolymer for biocomposite applications	$21,000	A. Ullah	2014-2019	$105,000
ALMA and Alberta Chicken Producers	Gelatin: New ideas to add value to an old molecule.	$103,333	M. Betti and Z. Pietrasik	2014-2017	$310,000
ALMA/AI-BIO/Alberta Chicken Producers	Innovative functional ingredients from underutilized poultry proteins: salty and "kokumi: peptides	$110,000	M. Betti, M. Gaenzle and M. Ndagijmana	2012- 2015	$330,000
AI Bio	Monomers and biopolymers from plant oil for various industrial applications	$73,800	A. Ullah, A. Elias and Zeng	2014-2017	$194,400
NSERC create	NSERC CREATE for the Canadian Meat Education and Training Network (MEaTnet) for Assuring Meat Safety and Quality	$216,000	L. Saucier, W. Dixon, P. Purslow, S. Anders, E. Goddard, S. Phyllis, L. McMullen, M. Gaenzle, M. Betti,	2014 - 2020	$1,300,000

			T. Abundis and J. Johnston		
Agriculture Funding Consortium	Pilot preparation and application of formaldehyde-free wood adhesive from Alberta renewable materials	$100,000	J. Wu, H. Zeng and S. Chen	2013-2015	$200,000
NSERC DG	Antioxidant peptides in inflammatory and endothelial function	$40,000	J. Wu	2013-2018	$200,000

Metabolism and Reproduction					**$25,000**
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	D. Korver	2013-2018	$125,000
AIBio/ALMA/CPRC/PIC/ACP	Incubation Temperature and Chick Quality	$0	D. Korver	2012-2014	$154,868

Poultry Systems					**$342,500**
Granting Body	**Abbreviated Title**	**Amount received in current year**	**Applicant(s)**	**Planned Duration**	**Total value of grant**
Alberta Chicken Producers	Precision Feeding and Lighting	$5,000	M. Zuidhof and G. Bedecarrats	2014-2017	$5,000
Canadian Poultry Research Council	Precision Feeding and Lighting	$22,500	M. Zuidhof and G. Bedecarrats	2014-2017	$50,000
ALMA	Precision Feeding and Lighting	$315,000	M. Zuidhof and G. Bedecarrats	2014 - 2017	$350,000

Technology Transfer Projects ($709,479)

Technology Transfer Projects				$709,479
Granting Body	**Abbreviated Title**	**Applicant(s)**	**Planned Duration**	**Total value of grant**
Growing Forward 2	Poultry Skills and Knowledge Development - Western Poultry Conference and Poultry Roundtable Series	V. Carney and B. Schneider	2014-2016	$292,102
Growing Forward 2	Knowledge dissemination and demonstrations to support prudent antibiotic use in the chicken supply chain	V. Carney and B. Schneider	2014-2016	$127,660
Growing Forward 2	Food Safety and Biosecurity for Small Flocks	M. Zuidhof, A. Kulinski, V. Carney, and B. Schneider	2014-2015	$43,200

Facility Usage

Research Facilities

Facility	Utilization Rate (%)				
	Overall	Broiler & Turkey Trials	Breeder Trials	Layer Trials	Unit Operations
Brooder house (48 floor pens)	32		4		28
Breeder hen cages (288 individual cages)	98			98	
Breeder male cages (60 individual cages)	0				
Nutrition house (32 pens)	13	13			
Specht pullet cages (64 group cages)	36	10		26	
Environmental chambers	72		72		
Test house - Floor pens (rare breeds)	100				100
Test House - Conventional cages	100			42	58
Test House - Colony cages	100				100
Broiler Processing Plant (3 days per use)	0	0			
Hatchery					
Setter use AVN	3	1		2	
Hatcher use AVN	2			2	
Setter use BIG J	2				2
Hatcher use BIG J	2				2

Non-Research Facilities

Facility	Description	Utilization
Lilydale Room	Combined producer meetings	2 days
	Processors	
	PRC alumni, exec group & educational institutions	32 days
	U of A, safety, animal care, animal handling, HACCP	1 days
	Industry related workshops (swine, dairy, AAF, etc.)	1 days
	Student presentations & community learning	29 days
Alberta Turkey Producers Computer Lab	Heavy use by graduate students, undergraduate students, technicians and researchers	25 person hours /d

Evidence of Productivity

Articles published in refereed journals (n=38)

1. Arshad, M.; Saied, S.; Ullah, A. PEG-lipid Telechelics Incorporating Fatty Acids from Canola Oil: Synthesis, Characterization and Solution Self-assembly. RSC Advances 2014, 4(50): 26439.
2. Chakrabarti, S., Jahandideh, F. & Wu, J. (2014). Food-derived bioactive peptides on inflammation and oxidative stress. Biomed Research International. Volume 2014 (2014), Article ID 608979, 11 pages http://dx.doi.org/10.1155/2014/608979 (Invited Paper, Open Access).
3. Du L., Keplova L. Z. Khiari, and M. Betti. 2014. Preparation and characterization of gelatin from collagen biomass obtained through a pH-shifting process of mechanically separated turkey meat. *Poultry Science 93:989-1000*. (IF=1.53) PMID:24706977
4. Girgih, A. T. He, R., Malomo, S., Offengenden, M., Wu, J., & Aluko, R.E. (2014). Structural and functional characterization of hemp seed (Cannabis sativa L.) protein-derived antioxidant and antihypertensive peptides. Journal of Functional Foods. 6: 384-394.
5. Gottardi D., P.K. Hong, M. Ndagijimana and M. Betti. 2014. Conjugation of gluten hydrolysates with glucosamine at mild temperatures enhances antioxidant and antimicrobial properties. *LWT Food Science & Technology 57:181-187*. (IF=2.55)
6. Holley, RA, T. Jones and LM McMullen. 2014. Food inspection analysis – safety in numbers? Canadian Food Insights. Spring 2014 pages 44-46.
7. Hong P.K., 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*. (IF=3.26) PMID:24001843
8. *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* (IF=4.28).
9. Intarasirisawat, R., Benjakul, S., Visessanguan, W. and Wu, J. (2014). Effects of skipjack roe protein hydrolysate on properties and oxidative stability of fish emulsion sausage. LWT - Food Science and Technology. 58 (1): 280–286.
10. Khiari Z., Z. Pietrasik, N. Gaudette and M. Betti. 2014. Poultry protein isolate prepared using an acid solubilization/precipitation extraction influences the microstructure, the functionality and the consumer acceptability of a processed meat product. *Food Structure 2:49 – 60*.
11. Khiari Z., M. Ndagijimana and M. Betti. 2014. Low molecular weight bioactive peptides derived from the enzymatic hydrolysis of collagen after isoelectric solubilisation/precipitation process of turkey by-products. *Poultry Science Poultry Science 93:2347-62.* (*IF=1.53*) PMID:24931971
12. Khosa, MA.; Ullah, A. In-situ modification, regeneration, and application of keratin biopolymer for arsenic removal. *Journal of Hazardous Materials* 2014, 278:360
13. Li, Z., You, J., Luo, Y. & Wu, J. (2014). Purification and characterization of parvalbumin isotypes from grass carp. Journal of Agricultural and Food Chemistry. 62 (26): 6212–6218.
14. Liu, X, U Basu, P Miller, LM McMullen. 2014. Stress response and adaptation of *Listeria monocytogenes* 08-5923 exposed to a sublethal dose of carnocyclin A. Appl Environ Microbiol 80:3835-3841.
15. Liu, X, P Miller, U Basu, and LM McMullen. 2014. Sodium chloride-induced filamentation and alternative gene expression of fts, murZ and gnd in *Listeria monocytogenes* 08-5923 on vacuum-packaged ham. FEMS Microbiol Lett 360:152-156.
16. Lohans, CT, MJ van Belkum, SA Cochrane, Z. Huang, CS Sit, LM McMullen and JC Vederas. 2014. Biochemical, structural, and genetic characterization of tridecaptin A1, an antagonist of *Campylobacter jejuni. ChemBioChem* 15:243-249.
17. Majumder, K., Chakrabarti, S., Morton, J. S., Panahi, S., Kaufman, S., Davidge, S. T. & Wu, J. (2014). 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 (Open Access).
18. McLeod†, E. S., M. A. Jalal, and M. J. Zuidhof. 2014. Modeling ovarian follicle growth in commercial and

heritage Single Comb White Leghorn hens. Poult. Sci. 93:2932-2940.
19. Mewis, J. L., X. Sun, M. J. Zuidhof, and L. L. Guan‡. 2014. Research note: Methodology for high quality RNA extraction from poultry whole blood for further gene expression analysis. Br. Poult. Sci. 55:194-196.
20. Miller P and LM McMullen. 2014. Mechanism for temperature-dependent production of piscicolin 126. Microbiology 160:1670-1678.
21. Moraes, T. G. V., A. Pishnamazi, E. T. Mba, I. I. Wenger, R. A. Renema, and M. J. Zuidhof‡. 2014. Effect of maternal dietary energy and protein on live performance and yield dynamics of broiler progeny from young breeders. Poult. Sci. 93:2818-2826.
22. Navidghasemizad, S., Temelli, F., & Wu, J. (2014). Effect of enzymatic hydrolysis on the extractability of phospholipids from leftover egg yolk using supercritical CO2. Separation and Purification Technology. 122(2): 192–198
23. Navidghasemizad, S., Temelli, F., & Wu, J. (2014). Enzymatic treatments impact on physicochemical properties of leftover egg yolk pellet after Immunoglobulin Y separation. Journal of American Oil Society Science 91:1857-1866.
24. Navidghasemizad, S., Temelli, F., & Wu, J. (2014). Moisture impact on extractability of phospholipids from leftover egg yolk after enzymatic treatment using supercritical carbon dioxide. Food and Bioproducts Processing. DOI: 10.1016/j.fbp.2014.07.002.
25. Navidghasemizad, S., Temelli, F., & Wu, J. (2015). Phase Separation Behavior of Egg Yolk Suspensions after Anionic Polysaccharides Addition. Carbohydrate Polymers 117, 297-303.
26. Navidghasemizad, S., Temelli, F., & Wu, J. (2014). Physicochemical properties of leftover egg yolk after livetins removal. European Food Research and Technology. 55(1): 170–175.
27. Nimalaratne, C., Sun, C., Wu, J., Curtis, J. M. & Schieber, A. (2014). Quantification of selected fat soluble vitamins and carotenoids in infant formula and dietary supplements using fast liquid chromatography coupled with tandem mass spectrometry. Food Research International. 66: 69-77.
28. Peng, H., B. Hu, Q. Liu, Z. Yang, X. Lu, R. Huang, X-F Li, M. J. Zuidhof, and X. C. Le‡. 2014. Liquid chromatography combined with atomic and molecular mass spectrometry for speciation of arsenic in chicken liver. J. Chromatogr. A. 1370:40-49.
29. Pishnamazi, A., R. A. Renema, M. J. Zuidhof‡, and F. E. Robinson. 2014. Effect of age at photostimulation on sexual maturation in broiler breeder pullets. Poult. Sci. 93:1274-1281.
30. Ren, J. & Wu, J. (2014). Preparation of high purity phosvitin using anion exchange chromatography. Food Chemistry. 158: 186–191.
31. Renama, M., & Wu, J. (2014). Antioxidant activity in cooked and simulated digested eggs. Food & Function. 5(7): 1464-1474.
32. Saunders-Blades, J. L. and D. R. Korver. 2014. The effect of maternal vitamin D source on broiler hatching egg quality, hatchability, and progeny bone mineral density and performance. J. Appl. Poult. Res. 23:773–783.
33. Saunders-Blades, J. L. and D. R. Korver. 2015. The effect of hen age and maternal vitamin D source on performance, hatchability, bone mineral density, and progeny in vitro early innate immune function. Submitted to Poult. Sci. Manuscript PS-14-04244.
34. Wang, C., Wu, J., Bernard, G. M., & Wasylishen, R. E. (2014). Preparation and characterization of canola protein isolate-poly(glycidyl methacrylate) conjugates: a bio-based adhesive. Industrial Crops and Products. 57:124-131.
35. Wang, J. & Wu, J. (2014). An improved method to extract and purify cystatin from hen egg white. Journal of Chromatography .B, Analytical Technologies in the Biomedical and Life Sciences. 963: 10-15.
36. You, J., Luo, Y. Wu, J. (2014). Conjugation of ovotransferrin with catechin showed improved antioxidant activity. Journal of Agricultural and Food Chemistry. 62(12): 2581-7.
37. Zou, P., Wang, J.-L., He, G.-Q., Wu, J. (2014). Purification, Identification and in vivo Activity of Angiotensin I-Converting Enzyme Inhibitory Peptide, Leu-Trp, from Ribbonfish (Trichiurus haumela) Backbone. Journal of Food Science. 79(1): C1–C7.
38. Zuidhof‡, M. J., V. L. Carney, B. L. Schneider, D. R. Korver, and F. E. Robinson. 2014. Growth, Efficiency, and Yield of Commercial Broilers from 1957, 1978, and 2005. Poult. Sci. 93:2970-2982.

Proceedings (n=3)

1. Zuidhof, M. J. 2014. Importance of protein and energy nutrition in broiler breeders. Proceedings of the FACTA (APINCO Foundation of Poultry Science and Technology) 2014 Conference. August 18-20, 2014. 12. São Paulo, Brazil. 8 pp.
2. Zuidhof, M. J. 2014. Innovation in feed allocation for broiler breeders. Proceedings of the III Poultry Nutrition International Seminar, AMEVEA (Asociación Colombiana de Médicos Veterinarios y Zootecnistas Especialistas en Avicultura). September 17-18, 2014. Bogotá Colombia. 12 pp.
3. Zuidhof, M. J. 2014. Strategies for managing breeder pullets. Proceedings of the Arkansas Nutrition Conference. September 9-11, 2009. Rogers, AR. 9 pp.

Presentations and Abstracts (n=45)

1. Akabari, A. and Wu, J. (2014). Preparation of canola protein nanoparticles using cold gelation method. Poster presentation at the 2014 Institute of Food Technologies (IFT) Annual Meeting & Expo, June 21-24, 2014, New Orleans, Louisiana, USA.
2. Akbari, A., and Wu, J. (2014). Preparation and evaluation of cruciferin/chitosan nanoparticles for encapsulation of bioactive compounds. 7th International Conference and Exhibition on Nutraceuticals and Functional Foods, October 14-17, 2014, Istanbul, Turkey.
3. Arshad, M.; Ullah, A. Synthesis of PEG-lipid bioconjugates via click reaction and their solution self-assembly, 13th International Symposium on Bioplastics, Biocomposites & Biorefining: Moving towards a Sustainable Bioeconomy May 19-24, 2014, Guelph, Ontario, Canada.
4. Arshad, M.; Ullah, A. Green Hybrid Biocomposites from Nano-engineered Natural Fiber and Biopolymer, 3rd ASEAN-Pak Conference on Materials Science (APCoMS-3) November 25-27, 2014, Islamabad, Punjab, Pakistan.
5. Bandara, N., Zeng, H., and Wu, J. (2014). Improving adhesion properties of canola protein based wood adhesive using nano materials. Second International Conference on Biobased and Bioinspired Materials and Chemistry, October 15-18, 2014, Nice, France.
6. Balutis, A., M.G. Gänzle and L.M. McMullen. 2014. Quantification of Carnobacterium maltaromaticum bacteriocin gene expression on refrigerated vacuum-packaged ham. International Association of Food Protection Annual Conference, Aug 3-6, 2014, Indianapolis, IN.
7. Bello, A. and D. R. Korver. 2014. Assessment of low dietary calcium and phosphorus on egg and bone properties of white egg layers. Poult. Sci. 93(E-Suppl. 1):13. 2014 Poultry Science Association Annual Meeting, Corpus Christi, TX, July 14, 2014.
8. Carney, V., Kulinski, A., Schneider B., - Genetic Preservation: A consumer education tool; Oral presentation at the Poultry Science Association Annual Meeting, Corpus Christi , Texas, July 13-17
9. Cho, M. and D. R. Korver. 2014. Development of a heterophil extracellular trap assay to determine the effect of broiler chick age and sex on ex vivo innate immunity against Escherichia coli. Poult. Sci. 93(E-Suppl. 1):7. 2014 Poultry Science Association Annual Meeting, Corpus Christi, TX, July 14, 2014.
10. Fatemi, S. A. and D. R. Korver. 2014. The effect of dietary 25-hydroxycholecalciferol on growth and carcass traits in an unsanitary environment. Poult. Sci. 93(E-Suppl. 1):19. 2014 Poultry Science Association Annual Meeting, Corpus Christi, TX, July 14, 2014.
11. Du,L., K. Zied, M. Ndagijimana, and M. Betti. Cryoprotective peptides derived from chicken skin collagen. 17 World Congress in Food Science and Technology (IUFoST), August 17-21, Mont Real (Canada).
12. Esparza, Y., and Wu, J. (2014). Reinforced Bioplastics from Chicken Feathers. Poster Presentation at the 13th International Symposium on Bioplastics, Biocomposites and Biorefining (ISBBB-2014), May 19th to 24th, Guelph, Ontario, Canada.
13. Hong P.K., Du L., M. M. Ndagijimana and M. Betti. 2014. Glycation and Enzymatic Glycosylation of Fish

Gelatin Hydrolysates with Glucosamine Enhanced Iron Uptake in Caco2 Cell Culture Model. 17th World Congress in Food Science and Technology (IUFoST), August 17-21, Mont Real (Canada).
14. Hong P.K., Du L., M. M. Ndagijimana and M. Betti. 2014. Glycation and Enzymatic Glycosylation of Fish Gelatin Hydrolysates with Glucosamine Enhanced Iron Uptake in Caco2 Cell Culture Model. 17 World Congress in Food Science and Technology (IUFoST), August 17-21, Mont Real (Canada).
15. Hrynets Y., L. Du, M. Ndagijimana and M. Betti. 2014. Transglutaminase-mediated glycosylation affects thermal denaturation of myofibrillar proteins. 17th World Congress in Food Science and Technology (IUFoST), August 17-21, Mont Real (Canada).
16. Hrynets Y., L. Du, M. Ndagijimana and M. Betti. 2014. Transglutaminase-mediated glycosylation affects thermal denaturation of myofibrillar proteins. 17th World Congress in Food Science and Technology (IUFoST), August 17-21, Mont Real (Canada).
17. Jahandideh, F., and Wu, J. (2014). Anti-inflammatory properties of ovotransferrin-derived antioxidant peptides. Poster Presentation at the17th World Congress of Food Science and Technology (IUFoST) and EXPO, August 17-21, Montreal, Canada.
18. L. Du, K. Zied, M. Ndagijimana, and M. Betti.2014. Cryoprotective peptides derived from chicken skin collagen. 17th World Congress in Food Science and Technology (IUFoST), August 17-21, Mont Real (Canada). 17th World Congress in Food Science and Technology (IUFoST), August 17-21, Mont Real (Canada).
19. D. Korver. 2014. Laying Hen Immunity and Control of Food-borne Illness. Arkansas Association for Food Protection. September 12, 2014. Fayetteville, AR USA.
20. Marasi, S.; Khosa, MA.; Ullah, A. Surface and In-situ modifications of keratin biopolymer for sorption of arsenic, 3rd ASEAN-Pak Conference on Materials Science (APCoMS-3) November 25-27, 2014, Islamabad, Punjab, Pakistan.
21. McMullen, LM. and M.G. Ganzle. 2014. High pressure processing inactivation of sporeforming bacteria. International Association of Food Protection Annual Conference, Aug 3-6, 2014. Indianapolis, IN.
22. Nimalaratne, C., Savard, P., Gauthier, S. F., and Wu, J. (2014). Changes in profile and bio-accessibility of carotenoids in cooked eggs during simulated gastrointestinal digestion using a dynamic gastrointestinal system (TIM-1). Poster Presentation at the 17th World Congress of Food Science and Technology (IUFoST) and EXPO, August 17-21, Montreal, Canada.
23. Paradhan, RA.; Arshad, M.; Ullah, A. Lipid Derived block copolymers for Drug Delivery applications, International Conference: Polymeric Biomaterials, Bioengineering & Biodiagnostics October 27-30, 2014, New Delhi, India
24. Pongmanee, K., I. Kühn, and D. R. Korver. 2014. Egg production, shell quality, and bone traits in laying hens fed diets differing in phosphorus and phytase levels.. Poult. Sci. 93(E-Suppl. 1):13. 2014 Poultry Science Association Annual Meeting, Corpus Christi, TX, July 14, 2014.
25. Ren, J. and Wu, J. (2014). Preparation and characterization of phosphopeptides from chicken egg yolk. Poster presentation at the 2014 Institute of Food Technologies (IFT) Annual Meeting & Expo, June 21-24, 2014, New Orleans, Louisiana, USA.
26. Satchwell, K., C. Lothans, J.C. Vederas and L.M. McMullen. 2014. Isolation and purification of microcin N — a bacteriocin effective against Salmonella enterica and Escherichia coli. International Association of Food Protection Annual Conference, Aug 3-6, 2014, Indianapolis, IN.
27. Schneider, B. L., V. L. Carney, and D. R. Korver. 2014. Managing mediums: Education and field studies in the Alberta egg industry.. Poult. Sci. 93(E-Suppl. 1):68. 2014 Poultry Science Association Annual Meeting, Corpus Christi, TX, July 16, 2014.
28. Teixeira, J., M.G. Gänzle and L.M. McMullen. Effect of growth temperature and process temperature on the resistance of Listeria monocytogenes to high pressure. 8th International Conference on High Pressure Bioscience and Biotechnology. July 15th – 18th 2014, Nantes, France.
29. Torres, C. A. and D. R. Korver. 2014. Trace element nutrition and bone metabolism. 50th Anniversary Annual Meeting of the Italian Branch – World's Poultry Science Association. Forli, Italy. April 15, 2014.
30. Ullah, A; Irfan, MF.; Khosa, MA.; Arshad, M. (May 22, 2014). Modifications of feather Keratin for biosorption and biocomposite applications, 13th International Symposium on Bioplastics, Biocomposites &

Biorefining: Moving towards a Sustainable Bioeconomy May 19-24, 2014, Guelph, Ontario, Canada.

31. Ullah, A.; Wu, J.; Temelli, F.; Siddique, T. Biopolymer-based nanocomposites from poultry byproducts for packaging applications. ALMA FutureFare 2014: Feeding the Demand. June 16-17, 2014, Edmonton, AB, Canada
32. Wismer W. So, what do you think of that chicken? Poultry Research Centre 2014 Annual General Meeting. Edmonton. May 14.
33. Wu, J. (2014). Establishing table eggs as a functional food: a molecular gastronomy approach Wroclaw Egg Banff Forum. 25 -27 June 2014, Wroclaw, Poland.
34. Wu, J. (2014). Food Protein Derived Bioactive Peptides and Their Potential Uses. Zhejiang University. Workshop on joint center Food for Health between University of Alberta and Zhejiang University on May 24 & seminar on May 25, Hangzhou, Zhejiang, China.
35. Wu, J. (2014). Revisit Food Protein Derived ACE Inhibitory Peptides: Roadmap for the Next 20 Years. Nanjing Agricultural University June 6, 2014, Nanjing, China.
36. Wu, J. (2014). Review on the stability and bioavailability of carotenoids in egg yolk. Oral Presentation at the 248th ACS National Meeting, August 10-14, San Francisco, California, USA.
37. Wu, J. (2014). Current research and commercial progress on food protein derived bioactive peptides. Oral Presentation at the 17th World Congress of Food Science and Technology (IUFoST) and EXPO, August 17-21, Montreal, Canada.
38. Wu, J. (2014). Research and development of protein-based adhesives. Oral Presentation at the 13th International Symposium on Bioplastics, Biocomposite & Biorefining, May 19-24, Guelph, Canada.
39. Wu, J. (2014). Revisit food protein derived ACE inhibitory peptides: what we can learn from the past? 2014 Annual Conference & Exhibition for Functional Foods, Nutraceuticals, Natural Health Products and Dietary Supplements, October 14-17, Istanbul, Turkey.
40. Yu, W., Field, C., and Wu, J. (2014). Immunomodulatory activities of bioactive peptides on male weanling Sprague-Dawley rats. The 105th AOCS annual meeting & Expo, May 4-7, 2014, San Anotonio, Texas, USA.
41. Yu, W., Field, C., and Wu, J. (2014). Immunomodulatory activity of spent hen hydrolysate in Sprague-Dawley Rtas. Poster Presentation at the 17th World Congress of Food Science and Technology (IUFoST) and EXPO, August 17-21, Montreal, Canada.
42. Zhang, S.; Arshad, M.; Ullah, A. Incorporation and in vitro release behavior of hydrophobic drug in Lipid-b-poly(ethylene glycol) micelles, 13th International Symposium on Bioplastics, Biocomposites & Biorefining: Moving towards a Sustainable Bioeconomy May 19-24, 2014, Guelph, Ontario, Canada.
43. Zheng, L., Luo, Y., and Wu, J. (2014). Purification and characterization of parvalbumin isotypes from grass carp (Ctenopharyngodon idellus). Poster presentation at the 17th IUFoST World Congress of Food Science and Technology and EXPO, August 17-21, Montreal, Canada.
44. Zuidhof, M. J., A.G.C. DesLauriers, I. I. Wenger, C. J. Bench, C. O. Ouellette, and T. Gilmet. 2014. Precision broiler breeder feeding for stable metabolism and high flock uniformity. Poultry Sci. 93(Suppl. 1):225.
45. Krynski†, A. J. P., J. D. Perryman†, A. G. C. DesLauriers, F. E. Robinson, and M. J. Zuidhof. 2014. Strategies for engaging poultry undergraduates through experiential learning. Poultry Sci. 93(Suppl. 1):303.

Lectures, Talks and Demonstrations (n=90)

1. Akbari, A. and Wu, J. Application of an egg white protein in drug delivery. Poultry Research Centre Annual General Meeting, May 28, 2013.
2. Arshad, M.; Ullah, A. Extraction and Identification of Lipids from Whole Chicken Carcass, Poultry Research Centre Annual General Meeting. May 14-15, 2014, Edmonton, Canada.
3. Asomaning, J., Field, C. J., Jacobs, R. L., Wu, J., Curtis, J. M., and “Team Choline”. Modification of egg lecithin and canola lecithin for functional food development. ALMA FutureFare 2014/Edmonton, Alberta. June 16-19.
4. Bandara, N. and Wu, J. Poultry Industry By-products in Wood Adhesive Development. Research presentation to Egg Farmers of Canada and Egg Farmers of Alberta Research Committees, Edmonton, Alberta. July 24.
5. Bandara, N., Wu, J. Potential of Poultry industry By-products in Adhesive Development. Poultry Research

Centre Annual General Meeting, May 28, 2013.

6. Bandara, N., Wu, J. Value added utilization of whole spent hen carcass in adhesive development. Alberta Poultry Industry AGM, Red Deer, Alberta. Feb 24, 2014.
7. Bello, A. and D. R. Korver. 2014. Assessment of low dietary calcium and phosphorus on egg and bone properties of white egg layers. Poultry Research Centre Annual General Meeting. May 14, 2014. Edmonton, AB.
8. Bench, C.J. Student engagement and talking posters session. Alberta Farm Animal Care Livestock Care Conference. March 26-27, 2014.
9. Betti, M. From lab to products: the journey of a poultry protein. Poultry Research Centre Annual General Meeting, May 14-15, 2014.
10. Carney, V. L. 2014. What you need to know and where to find it. An introductory presentation for new entrants to the Alberta Egg industry. Invited by Egg Farmers of Alberta, November 2014.
11. Carney, V. L. 2014. The Role of Primary Breeders in the Poultry Industry. AnSci 461. University of Alberta. September 2014
12. Carney, V. L, A. Kulinski, B. L Schneider. 2014. The value of heritage strains at the University of Alberta Presented to Egg Farmers of Canada and Egg Farmers of Alberta research committees. July 2014. Edmonton, AB
13. Carney, V. L. 2014. Poultry Research Centre Technology Transfer update and future planning presentation. Presented at the Poultry Research Centre Annual General Meeting. May, 2014. Edmonton, AB
14. Chang, L. Poultry Glycosaminoglycans: A new source of dietary “Animal Fibers” and candidate prebiotics? (Poster). Poultry Research Centre Annual General Meeting, May 14-15, 2014.
15. DesLauriers, A. G. C. and M. J. Zuidhof. 2014. Precision broiler breeder feeding. Poster presentation to Alberta Poultry Industry Meeting. Red Deer, AB. February 25, 2014.
16. DesLauriers, A. G. C. , and M. J. Zuidhof. 2014. Precision broiler breeder feeding. Poster presentation to Poultry Research Centre Annual General Meeting. Edmonton, AB. May 14, 2014.
17. Du, L., and M. Betti. Cryoprotective peptides derived from chicken collagen (Poster). Poultry Research Centre Annual General Meeting, May 14-15, 2014. Audience of 60.
18. Esparza, Y., Wu, J. Bio-based materials from chicken feather keratin. Research presentation to Egg Farmers of Canada and Egg Farmers of Alberta Research Committees, Edmonton, Alberta. July 24.
19. Esparza, Y., A. Ullah and J. Wu. Reinforced bioplastic from chicken feathers, Poultry Research Centre Annual General Meeting. May 14-15, 2014, Edmonton, Canada.
20. Fatemi, S. A. , D. R. Korver , C. Fitzsimmons , M. J. Zuidhof. 2014. The effect of dietary 25-hydroxycholecalciferol on growth and carcass traits in an unsanitary environment. Poultry Research Centre Annual General Meeting. May 14, 2014. Edmonton, AB.
21. Fedorak, M. V., and M. J. Zuidhof. 2014. Commercial potential of precision feeding. SKOV development team. Roslev, Denmark. November 18, 2014.
22. Feng, M. and M. Betti. In vitro anticholesteremic properties of turkey collagen peptides (Poster). Poultry Research Centre Annual General Meeting, May 14-15, 2014.
23. Gilmet, T., C. Bench, and M. J. Zuidhof. 2014. Behaviour and welfare of broiler breeders fed with a precision feeding system. Poster presentation to Alberta Poultry Industry Meeting. Red Deer, AB. February 25, 2014.
24. Gilmet, T., C. Bench, and M. J. Zuidhof. 2014. Behaviour and welfare of broiler breeders fed with a precision feeding system. Poster presentation to Alberta Farm Animal Care Annual General Meeting. Red Deer, AB. March 27, 2014.
25. Gilmet, T., Bench, C.J., Zuidhof, M.J. 2014. A new alternative in broiler breeder feeding management. Alberta Farm Animal Care Livestock Care Conference, Canada, Alberta, Edmonton. March 26. Poster.
26. Gilmet, T., Bench, C.J., Zuidhof, M.J. 2014. A new alternative in broiler breeder feeding management. Alberta Poultry Industry Annual General Meeting, Canada, Alberta, Red Deer. February 25. Poster.
27. Gilmet, T., Bench, C.J., Zuidhof, M.J. 2014. A new alternative in broiler breeder feeding management. Poultry Research Centre Annual General Meeting, Canada, Alberta, Edmonton. June. Poster.
28. Gu, Y., Li, Q. and Wu, J. Is spent hen a novel source of antihypertensive peptides? Poultry Research Centre Annual General Meeting, May 28, 2013.

29. Hincampie, D. and M. Betti. Chicken gelatin glycopeptides: In vitro growth inhibitors of E. coli (Poster). Poultry Research Centre Annual General Meeting, May 14-15, 2014.
30. Hong, P.K. and M. Betti. The "Maillard" hypothesis: binding sugars to gelatin peptides enhances iron absorption (Poster). Poultry Research Centre Annual General Meeting, May 14-15, 2014.
31. Hong, P.K. and M. Betti. Kokumi delicious peptides from poultry proteins: effects on salt reduction (Poster). Poultry Research Centre Annual General Meeting, May 14-15, 2014.
32. Hrynets, Y. and M. Betti. Can aminosugars replace nitrites in meat? Poultry Research Centre Annual General Meeting, May 14-15, 2014.
33. Jahandideh, F., Wu, J. The link between Renin angiotensin system (RAS) and type 2 diabetes. Research presentation to Egg Farmers of Canada and Egg Farmers of Alberta Research Committees, Edmonton, Alberta. July 24.
34. Jahandideh, F. Wu, J. Can table egg reduce your body cholesterol? Poultry Research Centre Annual General Meeting, May 28, 2013.
35. Klasing, K. C. and D. R. Korver Intended and unintended changes in immunity due to genetic selection of chickens. Western Nutrition Conference. Edmonton, AB. September 25, 2014.
36. Korver, D., W. Wismer, M. Kam, S. Singla, D. Yu and M. Betti. "Black bone" discolouration in broiler meat. Cargill Animal Nutrition (Costa Rica). February 17, 2014.
37. Korver, D., M. Cho, C. Lozano, M. Johnson, J. Saunders-Blades. MaxiChick use in Broiler Breeders (and Broilers). Cargill Animal Nutrition (Costa Rica). February 17, 2014.
38. Korver, D. Hy-D® in Broilers and Layers. Cargill Animal Nutrition (Costa Rica). February 17, 2014.
39. Korver, D., W. Wismer, M. Kam, S. Singla, D. Yu and M. Betti. "Black bone" discolouration in broiler meat. Walmart Poultry (Costa Rica) February 18, 2014.
40. Korver, D. Hy-D® in Broilers. Walmart Poultry (Costa Rica) February 18, 2014.
41. Korver, D. Hy-D® in Broilers Villalobos Poultry (Costa Rica) February 19, 2014.
42. Korver, D. Bone Mineral Density and Laying Hen Management. DSM Technical meeting (San Juan, Costa Rica) February 19, 2014.
43. Korver, D. Hy-D® in Broilers. Villalobos Poultry (Honduras). February 20, 2014.
44. Korver, D., Eggshell Quality in Laying Hens. CCR (Bogota, Colombia). April 23, 2014.
45. Korver, D. Laying Hen Bone Metabolism and Hy-D. CCR (Bogota, Colombia). April 23, 2014.
46. Korver, D. "Black bone" discolouration in broiler meat. Pronaca (Quito, Ecuador). April 24, 2014.
47. Korver, D. MaxiChick use in Broiler Breeders (and Broilers). Pronaca (Quito, Ecuador). April 24, 2014.
48. Korver, D. Laying Hen Bone Metabolism and Hy-D. Incubadora Santander (Bucaramanga, Colombia). April 25, 2014.
49. Korver, D. Effects of HyD on Mineral metabolism and performance of Broilers, Broiler breeders, Layers. Solla (Medellin, Colombia). December 5, 2014.
50. Korver, D. "Black bone" discolouration in broiler meat. Solla (Medellin, Colombia). December 5, 2014.
51. Korver, D. Effects of HyD on Mineral metabolism and performance of Broilers, Broiler breeders, Layers. Pollos El Bucanero (Buga, Colombia). December 11, 2014.
52. Korver, D. "Black bone" discolouration in broiler meat. Pollos El Bucanero (Buga, Colombia). December 11, 2014.
53. Korver, D. Optimizing calcium & phosphorous contribution and skeletal integrity through phytase use in broiler diets. Webinar (Watt Ag Net). April 8, 2014.
54. Korver, D. and C. A. Torres. Bone mineralization and development: Broiler performance. Colombian Veterinary and Animal Scientist Poultry Association -- Broiler Management. International Seminar. June 18, 2014.
55. Korver, D. Nutrition-Immune Function Interactions in Poultry. Asociación de Veterinarios Especialistas de Ciencias Avícolas de Occidente. Tepatitlán, Jalisco. México. August 14, 2014.
56. Korver, D. Trace Elements in Broiler Breeder Nutrition. Webinar (Novus International In-house staff seminar). September 3, 2014.
57. Korver, D. Bone Metabolism and Hy-D® in Laying Hens and Broilers. DSM Technical Conference. Bogota, Colombia. September 16, 2014.

58. Lozano, C. A., M. J. Zuidhof, and D. R. Korver. 2014. Effects of dietary 25-OH vitamin D3 and Canthaxanthin on broiler performance, livability and economics. Poster presentation to Alberta Poultry Industry Meeting. Red Deer, AB. February 25, 2014.
59. Lozano, C. A., M. J. Zuidhof, and D. R. Korver. 2014. Effects of dietary 25-OH vitamin D3 and Canthaxanthin on broiler performance, livability and economics. Poster presentation to Poultry Research Centre Annual General Meeting. Edmonton, AB. May 14, 2014.
60. Li, Q; Majumder, K; Wu, J. Egg Antihypertensive Peptides for Hypertension. Poultry Research Centre Annual General Meeting, May 28, 2013.
61. Lu, X. and M. Betti. Food grade extraction of glycosaminoglycan: A pilot study (Poster). Poultry Research Centre Annual General Meeting, May 14-15, 2014.
62. Majumder, K, , Wu, J. Antihypertensive Peptides from Egg White Protein Ovotransferrin. Research presentation to Egg Farmers of Canada and Egg Farmers of Alberta Research Committees, Edmonton, Alberta. July 24.
63. Majumder, K; Panahi, S; Morton, J; Jacobs, S; Davidge, S.T.; Wu, J. Fried Whole Egg Hydrolysate Reduces High Blood Pressure. Poultry Research Centre Annual General Meeting, May 28, 2013.
64. Marasi, S. Khosa, MA. Ullah, A. Biosorbents from Poultry Feathers, Poultry Research Centre Annual General Meeting. May 14-15, 2014, Edmonton, Canada.
65. Nain, S. and D. R. Korver. 2014. Egg enrichment : Recent advances using modified flaxseed. Poultry Research Centre Annual General Meeting. May 14, 2014. Edmonton, AB.
66. Nimalaratne, C., Schieber, A., Wu, J. Antioxidant Compounds in Chicken Egg yolk. Poultry Research Centre Annual General Meeting, May 28, 2013.
67. Oryschak, M.A., M.N. Smit, E. Beltranena. 2014. Overview of our recent poultry feedstuff research. Presented to Egg Farmers of Canada at Poultry Research Centre, University of Alberta, Edmonton, AB, July 23.
68. Ren, J. and Wu, J. The Beneficial Effects of Egg Yolk Phosphopeptides on Bone Health. Research presentation to Egg Farmers of Canada and Egg Farmers of Alberta Research Committees, Edmonton, Alberta. July 24.
69. Ren, J., Wu, J. Phosvitin phosphopeptides (PPP) from egg yolk. Poultry Research Centre Annual General Meeting, May 28, 2013.
70. Silva, F. A., M. J. Zuidhof, D. R. Korver, and R. Delgado. 2014. 25-OH vitamin D3 supplementation in laying hens. Identifying the right time to provide it. Poster presentation to Alberta Poultry Industry Meeting. Red Deer, AB. February 25, 2014.
71. Sun, X., Gänzle, M. and Wu, J. Ovomucin: potential prebiotics from egg white. Poultry Research Centre Annual General Meeting, May 28, 2013.
72. Teflisi, S., W. Wismer, C. Flemming, K. Chase, M. Oryschak, and E. Beltranena. 2014. Consumer acceptance of eggs from hens fed Camelina sativa meal. Alberta Chicken Producers Annual Meeting. Red Deer, AB, Feb. 24.
73. Teflisi S, Wismer W, Flemming C, Chase K, Oryschak M, Beltranena E. Consumer acceptance of eggs from hens fed Camelina sativa meal. Alberta Poultry Industry 2014 Annual General Meeting. Red Deer. Feb 25.
74. Ullah, A. Biomaterials from poultry byproductrs, Poultry Research Centre Annual General Meeting. May 14-15, 2014, Edmonton, Canada.
75. Wang, H. and M. Betti. Poultry glycosaminoglycans from different tissues and their effect of iron absorption (Poster). Poultry Research Centre Annual General Meeting, May 14-15, 2014.
76. Wu, J. How to move the egg research program forward? Research presentation to Egg Farmers of Canada and Egg Farmers of Alberta Research Committees, Edmonton, Alberta. July 24.
77. Wu, J., Majumder, K. and Qi Y. Scale-up Production of Antihypertensive Peptides from Egg Proteins. ALMA FutureFare 2014, Edmonton, Alberta. June 16-19.
78. You, J. Wu, J. Conjugation of ovotransferrin with catechin showed improved antioxidant activity. Poultry Research Centre Annual General Meeting, May 28, 2013.
79. Yu, W., Offengenden, M., Field, C. and Wu, J. Preparation of bioactive peptides from poultry by-products. Poultry Research Centre Annual General Meeting, May 28, 2013.
80. Zhang, D. and M. Betti. From globule to amyloid filaments: stretching proteins to enhance their functionality (Poster). Poultry Research Centre Annual General Meeting, May 14-15, 2014.
81. Zuidhof, M. J. 2014. Nutrition's role in broiler health. Invited presentation to Alberta Chicken Producers

Research Symposium. Red Deer, AB. February 24, 2014.

82. Zuidhof, M. J. 2014. Precision feeding for high flock uniformity: The right feed for the right bird. Invited presentation to the Egg Farmers of Canada Research Committee. Edmonton, AB. July 23, 2014.
83. Zuidhof, M. J. 2014. Precision broiler breeder feeding system: Pilot study highlights. Invited presentation to Alberta Hatching Egg Producers. Alberta Hatching Egg Producers Annual General Meeting. Red Deer, AB. February 25, 2014.
84. Zuidhof, M. J. 2014. Evolution in feeding meat-type breeders. Presentation to Poultry Research Centre Annual General Meeting. Edmonton, AB. May 14, 2014.
85. Zuidhof, M. J., and M. V. Fedorak. 2014. Precision Broiler Breeder Feeding System: Development highlights, prototype performance, commercial opportunity. Videoconference presentation to SKOV (Denmark). May 13, 2014.
86. Zuidhof, M. J. 2014. Environmental temperature and dietary energy affected core body temperature dynamics and efficiency in broiler breeder females. Sovereign Foods (South Africa). Edmonton, AB. January 23, 2014.
87. Zuidhof, M. J. Precision Broiler Breeder Feeding System: Development highlights; commercial and research opportunities. Cobb-Vantress staff and partners. Siloam Springs, AR. September 9, 2014.
88. Zuidhof, M. J. 2014. Precision Broiler Breeder Feeding System. Sovereign Foods (South Africa). Edmonton, AB. January 22, 2014.
89. Zuidhof, M. J., and M. V. Fedorak. 2014. Precision Feeding: A sustainable innovation. Alberta Livestock and Meat Agency Future Fare. Edmonton, AB. June 16-17, 2014.
90. Zuidhof, M. J., R. R. Davidson, H. Cunningham, T. Gilmet, and T. Krynski. Innovating, learning and sharing the message of food production. Alberta Turkey Producers fall growers meeting banquet. Edmonton, AB. November 14, 2014.

Research Reports (n=22)

1. Betti, M. and Z. Pietrasik. 2014. Preparation and characterization of high quality gelatin from different poultry sources. 2014. Alberta Livestock Meat Agency.
2. Betti, M. M. Gaenzle, M. Ndagijimana. 2014. Innovative functional ingredients from underutilized poultry proteins: salty and "kokumi" peptides (10 pages). Tables and figures were included in the appendix (7 pages).
3. Betti, M. and Z. Pietrasik 2014. Functional ingredients from poultry bone biomass: extraction, isolation and purification of chondroitin sulfate (10 pages).
4. Betti, M. M. Ndagijimana, K. Sato. Functionalized peptides for skin care produced from bovine and poultry collagen biomass (10 pages).
5. DesLauriers, A.G.C., M. J. Zuidhof, and D. R. Korver. 2014. Effect of protein on different male line broiler crosses. Final report to Aviagen, Inc. January 21, 2014. 33 pp.
6. Hamidu, J. A., C. A. Torres, M. L. Johnson and D. R. Korver. 2014. Effect of incubator temperature profiles and parent flock age in two broiler strains on embryonic overheating during incubation. Final report for ALMA project 2012F071R. 27 pages.
7. Korver, D. R., B. L. Schneider and V. L. Carney. 2014. Management strategies to increase Alberta egg farm revenue. Final report for ALMA project 2010F148R. 249 pages.
8. Korver, D. R., J. L. Saunders-Blades & H. Bruce. 2014. Comparison of bone density characteristics of breast and thigh from broiler and broiler breeder chickens. Final report to the Chicken Farmers of Canada and the Canadian Poultry Research Council. 7 pages.
9. Kulinski, A. and M. J. Zuidhof. 2014. Re-Gaining Value of Heritage Chickens – Marketing and Sale of Heritage Chicken Eggs. Final report to Alberta Livestock and Meat Agency. Project 2013L103D. January 31, 2014. 6 pp.
10. McMullen, LM and PJ Shand. 2014. Improving the safety and competitiveness of lean, low sodium meat products. 99 pages.
11. McMullen, LM. 2014. Impact of Micocin on the transfer of Listeria monocytogenes in a simulated deli

slicing and packing operation. 18 pages.

12. Ullah, A.; Wu, J.; Temelli, F.; Siddique, T. Biopolymer-based nanocomposites from poultry byproducts for packaging applications (10 pages).
13. Ullah, A.; Bajaj, DR. Filters from poultry feathers for removal of arsenic from contaminated drinking water in developing countries (12 pages).
14. Zuidhof, M. J. 2014. Precision broiler breeder feeding system. Interim report to Agriculture Funding Consortium. Project #2011F121R. March 9, 2014. 16 pp.
15. Wu, J. Final report for "Developing valuable functional food ingredients from spent hens (F2012R023R)", submitted to ALMA, 26 pages.
16. Wu, J. Final report for "Functional egg bioactive peptides: scale-up processing and in vivo efficacy (#2011F027R)", submitted on November 28, 2014 to Alberta Livestock and Meat Agency Ltd. (ALMA) final report 43 pages.
17. Wu, J. Final report "Development of infant formula from ovomucin", submitted to ALMA33 pages.
18. Wu, J. Interim report "Scale-up preparing adhesive from spent hens", submitted to Canadian Poultry Research Council, 10 pages.
19. Wu, J. Interim report "Pilot preparation and application of formaldehyde-free wood adhesive from Alberta renewable materials (2013F150R)" submitted to ALMA, 11 pages.
20. Interim report "Antioxidants in laying hens", submitted to NSERC, 12 pages.
21. Zuidhof, M. J. 2014. Precision broiler breeder feeding system. Interim report to Canadian Hatching Egg Producers. February 17, 2014. 8 pp.
22. Zuidhof, M. J. 2014. Precision broiler breeder feeding. Report to Alberta Hatching Egg Producers. January 29, 2014. 1 page.

Patent Applications (n=1)

Ullah, A., Siddique, T. Bio-based Sorbents for Removal of Contaminants from Waste/Oil Sand Process-Affected Water (OSPW), US Provisional Patent Application (Number: 62/091,051)

Financial Report 2014-15

Income 2014 - 2015	Actuals as of March 31, 2015		
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
Maple Leaf	15,000.00		15,000.00
Lilydale	15,000.00		15,000.00
Poultry Health Services		35,000.00	35,000.00
Sub-total	**244,382.00**	**35,000.00**	**279,382.00**
Opening balance	75,478.24		75,478.24
TOTAL INDUSTRY	**319,860.24**	**35,000.00**	**354,860.24**

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	257,578.82		257,578.82
TOTAL ALMA/AI-Bio	**357,578.82**		**357,578.82**

U of A			
U of A/AFNS	190,612.28	1,552,480.00	1,743,092.28
Poultry Unit (Internal revenue)	94,143.00		94,143.00
Poultry Unit (External revenue)	242,180.16		242,180.16
Sub-total	**526,935.44**	**1,552,480.00**	**2,079,415.44**
Opening balance	73,478.93		73,478.93
Total U of A	**600,414.37**	**1,552,480.00**	**2,152,894.37**

	Cash	**In-Kind**	**Total**
Total Income	**1,338,214.05**	**1,925,080.00**	**3,263,294.05**

Expenses 2014 - 2015	Actuals as of March 31, 2015		
	Cash	**In-Kind**	**Total**
Salaries and benefits	843,569.95		843,569.95
Supplies	149,966.33		149,966.33
Travel	6,915.20		6,915.20
Equipment	46,395.46		46,395.46
Overhead	5,000.00		5,000.00
Total Expenses	**1,051,846.94**	**1,925,080.00**	**2,976,926.94**

Revenue/Expense Summary 2014 - 2015		Actuals as of March 31, 2015	
	Cash	**In-Kind**	**Total**
Total Income (incl. carryover)	1,338,214.05	1,925,080.00	3,263,294.05
Total Expenses	1,051,846.94	1,925,080.00	2,976,926.94
Total carryover to 2015/2016	**286,367.11**	**0.00**	**286,367.11**

Budget 2015 - 2016

Income 2015 -2016 (Budget)

Industry	Cash	In-Kind	Total
Alberta Turkey Producers	29,749.00		29,749.00
Alberta Hatching Egg Producers	33,845.00		33,845.00
Alberta Chicken Producers	95,730.00		95,730.00
Egg Farmers of Alberta	37,044.00		37,044.00
Egg Farmers of Canada	15,000.00		15,000.00
Burnbrae Farms	8,500.00		8,500.00
Lilydale	15,000.00		15,000.00
Maple Leaf	15,000.00		15,000.00
Poultry Health Services		35,000.00	35,000.00
Sub-total	**249,868.00**	**35,000.00**	**284,868.00**
Opening balance	53,077.02		53,077.02
TOTAL INDUSTRY	**302,945.02**	**35,000.00**	**337,945.02**

AARD	**43,000.00**	**337,600.00**	**380,600.00**
Opening balance	27,027.96		27,027.96
TOTAL AARD	**70,027.96**	**337,600.00**	**407,627.96**

ALMA	0.00		0.00
AI-Bio	100,000.00		100,000.00
Sub-total	**100,000.00**		**100,000.00**
Opening balance	29,110.87		29,110.87
TOTAL ALMA/AI-Bio	**129,110.87**		**129,110.87**

U of A			
U of A/AFNS	201,000.00	1,552,480.00	1,753,480.00
Poultry Unit (Internal revenue)	70,000.00		40,000.00
Poultry Unit (External revenue)	160,000.00		165,000.00
Sub-total	**431,000.00**	**1,552,480.00**	**1,983,480.00**
Opening balance	177,151.26		73,478.93
Total U of A	**608,151.26**	**1,552,480.00**	**2,160,631.26**

	Cash	In-Kind	Total
Total Income	**1,110,235.11**	**1,925,080.00**	**3,035,315.11**

Expenses 2015 - 2016 (Budget)

	Cash	In-Kind	Total
Salaries and benefits	800,000.00		795,000.00
Supplies	125,000.00		190,000.00
Travel	10,000.00		15,000.00
Equipment	10,000.00		25,000.00
Overhead	0.00		7,500.00
Total Expenses	**945,000.00**	**1,925,080.00**	**2,870,080.00**

Revenue/Expense Summary 2015 - 2016 (Budget)

	Cash	In-Kind	Total
Total Income (incl. carryover)	1,110,235.11	1,925,080.00	3,035,315.11
Total Expenses	945,000.00	1,925,080.00	2,870,080.00
Total carryover to 2016/17	**165,235.11**	**0.00**	**165,235.11**

Unit Report

Unit Financial Report 2014 - 2015

Income 2014 – 2015	**Actuals as of March 31, 2015**
	Total
U of A/AFNS	190,612.28
Poultry Unit (Internal revenue)	94,143.00
Poultry Unit (External revenue)	242,180.16
Sub-total	**526,935.44**
Opening balance	73,478.93
Total Income	**600,414.37**

Expenses 2014 – 2015	**Actuals as of March 31, 2015**
	Total
Salaries and benefits	235,533.45
Supplies	141,334.20
Equipment	46,395.46
Total Expenses*	**423,263.11**

Income/Expense Summary 2014 - 2015	**Actuals as of March 31, 2015**
Total Income	600,414.37
Total Expenses	423,263.11
Carryover/surplus to 2015/16	**177,151.26**

Unit Budget 2015 - 2016

Income 2015 - 2016 (budget)

	Total
U of A/AFNS	201,000.00
Poultry Unit (Internal revenue)	70,000.00
Poultry Unit (External revenue)	160,000.00
Sub-total	**431,000.00**
Opening balance	177,151.26
Total Income	**608,151.26**

Expenses 2015 - 2016 (budget)

	Total
Salaries and benefits	300,000.00
Supplies	180,000.00
Equipment	50,000.00
Total Expenses*	**530,000.00**

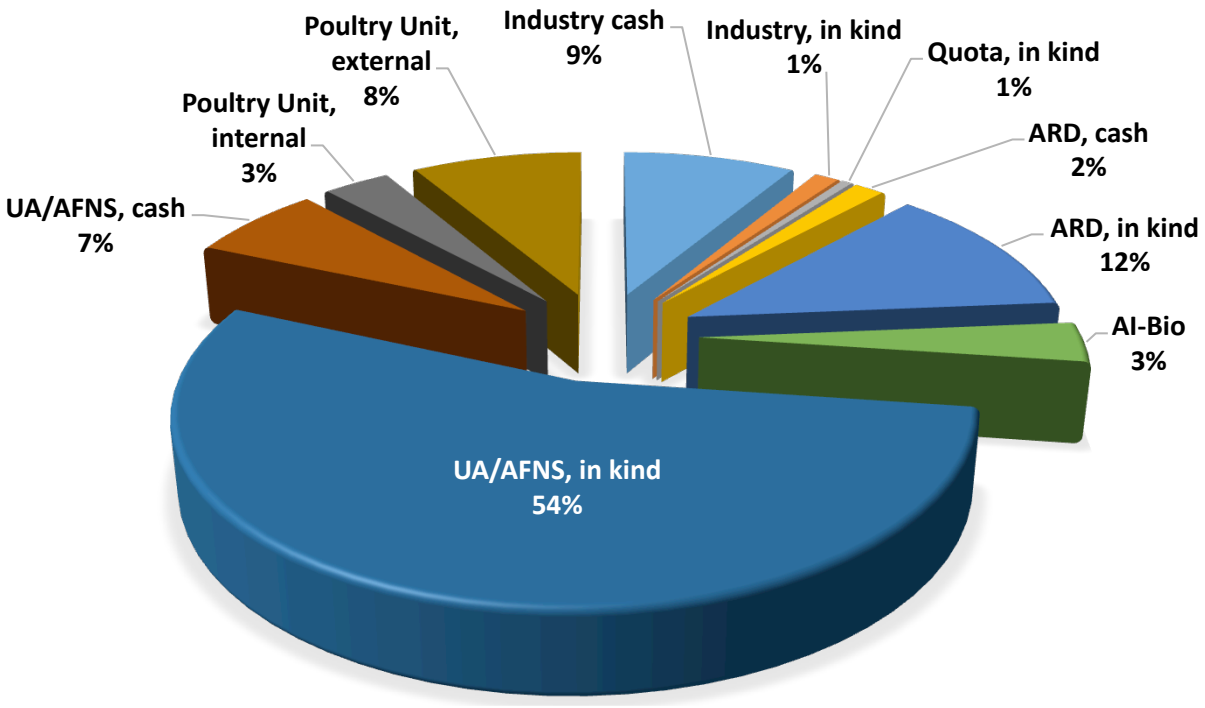
Income/Expense Summary 2015 - 2016 (budget)

Total Income	608,151.26
Total Expenses	530,000.00
Carryover (surplus) to 2016/17	**78,151.26**

Acronyms and Abbreviations Used

AAFC	Agriculture and AgriFood Canada
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
AMU	Antimicrobial Use
ARD	Alberta Agriculture and Rural Development
ATP	Alberta Turkey Producers
BW	Body weight
CAAP	Canadian Agricultural Adaptation Program
CHEP	Canadian Hatching Egg Producers
CPRC	Canadian Poultry Research Council
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 CRD	NSERC Collaborative Research and Development Grant
NSERC DG	NSERC Discovery Grant
NSERC RT	NSERC Research Tools and Instruments Program
PhD	Doctor of Philosophy
Post doc	Post doctoral fellow
PRC	Poultry Research Centre
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

PRC Funding - All sources received in 2014-2015 ($2,839,397)



PRC Funding - Industry cash sources received in 2013-2014 ($244,382)