Advancing our industry through evidence-based research

Research summary overview

Our Research Grant Program actively supports research projects in a variety of fields at universities across Canada. Each research project is linked to at least one of Egg Farmers of Canada's research priorities. Below is an introduction to these research projects as well as their status.

2022 EFC GRANT PROGRAM RESEARCH SUMMARY

PROJECT NAME	PAGE	RESEARCH PRIORITY AREA ADDRESSED								
		Animal care science	Food safety	Human nutrition and health	End of flock management	Innovative uses of eggs	Environment and sustainability	Bird nutrition and health	Public policy and economics	Research gaps identified by the Code of Practice
Eggshell membrane nano-particles for biomedical applications	5					X				
Mining the hen gastrointestinal microbiome for novel anti-infective probiotics to reduce the incidence of bacterial infections	5							X		
Cuticle proteins in diverse lines of hens	5		X							
Get cracking for diabetes: An egg-based breakfast for improving blood glucose control in type 2 diabetes	6			X						
Egg white-alginate based biomaterial for 3D tissue engineering	6					X				
Precision feeding layers for improved uniformity, production and sustainability	6							X		

EGG FARMERS OF CANADA

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		Animal care science	Food safety	Human nutrition and health	End of flock management	Innovative uses of eggs	Environment and sustainability	Bird nutrition and health	Public policy and economics	Research gaps identified by the Code of Practice
Development of strategies for control of avian influenza virus transmission	6							X		
The role of omega-3 fatty acids in bone development in pullets: Investigating epigenomic response to breeder and perinatal nutrition	7							X		
How much omega-3 fatty acids do hens require for optimal health and productivity?	7							X		
A novel non-antibiotic strategy for controlling avian pathogenic *Escherichia coli* in laying hens	7							X		X
Importance of eggshell cuticle quality for reducing bacterial adherence in table eggs	7		X							
Assessment of the impact of Canadian infectious bronchitis virus variants on egg production and fertility in laying hens	7							X		X
Determination of the metabolic triggers responsible for sexual maturation in laying hens and their relation to rearing environment and nutrition	7							X		X
Precision pullet rearing strategies for optimal reproductive body condition	8							X		X
Egg yolk lecithin supplementation to improve pulmonary health: Implications for healthy individuals and individuals with chronic obstructive pulmonary disease	8			X						
Develop new application of egg protein ovotransferrin as a functional food ingredient on bone health	8			X		X				
Modified eggshell membrane formulations as a novel supplement to maintain gut health	8			X		X				
Optimization of vaccination strategies for laying hens controlling egg production problems induced by currently circulating infectious bronchitis virus variants	8							X		X
The fermentation of end-of-lay hen hydrolysate to produce pathogen free microbiological-rich plant nutrient solutions	8				X					
The beneficial effect of egg-derived phosphatidylcholine on the obesity-related immune dysfunction	9			X						
Animal implant studies with nano-textured eggshell-based constructs for bone regeneration	9			X		X				
Use of 3D kinematics and genomics to evaluate perching biomechanics in commercial and heritage strains of enriched colony housed pullets and laying hens	9	X								X
Impact of alternative housing systems on layer health and egg production	9	X						X		
Egg as a strategy to maintain retina health in people with diabetes	10			X						

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Functional feedstuffs to bolster performance and immunocompetence of pullets reared at different rearing densities in enriched colony housing systems	10							X		X
Optimization of environmental and hen welfare outcomes in Canadian egg production using predictive analytics (machine learning) techniques	10						X			
Determination of ideal perch space allowance for pullets	10	X								X
The role of eggs in improving choline and DHA nutrition during development	10			X						
Sustainable composites from waste eggshells for practical applications	11					X	X			
Assessing hatchery related well-being	11	X								X
Development of novel and alternative approaches using small-RNA based immune-stimulant molecules for control of avian infectious bronchitis virus	11							X		
Effect of LED flicker on the welfare, health, and production of pullets reared to 16 weeks and further impacts on hen performance and egg production and quality	11	X								
Impact on metabolic health of new ingredients enriched with active components derived from egg yolk	11			X		X				
Understanding the social representations of meat, eggs and animal proteins replacement products and their impact on food habits	11								X	
Whole eggs for reducing inflammation and promoting muscle repair in adults with obesity	11			X						
Surveillance of egg yolk peritonitis (EYP) and causative *Escherichia coli* in Alberta egg farms	11							X		
A detailed characterization of particular matter in Canadian egg farms	12						X	X		
Long-life layers: An environmental, economic, and animal welfare cost/benefit analysis	12						X		X	
The use of pecking blocks as foraging enrichment for improvement of feather condition in enriched colonies	12	X								X
Pre-hatch sexing for chicks based on chorioallantoic membrane (CAM) immune-interrogation	12	X					X			
Egg versus whey protein as the optimal supplement for fitness-conscious people	12			X		X				
Cold plasma pasteurization of liquid whole eggs	12		X							
Use of full-body imaging scans on live hens to develop a model describing the impact of body composition on sexual maturation	13							X		X

PROJECT NAME	PAGE	RESEARCH PRIORITY AREA ADDRESSED								
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Supplementation strategies in vitamin D to protect layers from vitamin D deficiency and immunological stress	13			X				X		
From eggshell wastes to key components in green energy storage and conversion	13					X				
Evaluation of hemp seed products to ameliorate fatty liver disease and reduce cannibalism in laying hens	14	X		X				X		
Manipulation of maturity with light during incubation	14							X		
Expanding opportunities for Western Canadian fava bean (*Vicia faba*) as a feedstuff for laying hens	14						X	X		
Role of omega-3 eggs in reducing pro-oxidative and inflammatory effects of omega-6 poly-unsaturated fatty acids (PUFA) in diabetic and geriatric hearts	14			X						
Perching requirements for pullets and laying hens: Preferences for grasping and elevation	14	X								X
EGGS-actly what's required: Eggs as an appealing way to restore nutritional status after cancer treatment	15			X						
Building a usable surveillance and monitoring tool for avian influenza outbreaks in Canada	15							X		
Understanding feather pecking in laying hens: The gut-microbiome-brain connection II	15	X						X		
An integrated process for recovering calcium carbonate and collagen/collagen amino acids from waste shells	15			X		X	X			
From potential to implementation: Evaluating alternatives to antibiotics in layers through coordinated in vivo experimental studies and barn-level surveillance with industry partners	15							X		
Towards circular manufacturing strategies for the egg industry using eggshells as value-added mortar filler material for large-scale additive manufacturing	15					X	X			
Including egg protein as part of a plant-based dietary pattern improves cardiometabolic health by ameliorating fatty liver disease	15			X						
Egg residue depletion of oral topical formulations of Fluralaner (Bravecto™) in laying hens	16	X	X					X		
Antimicrobial peptides: A better alternative to antibiotics on egg farms	16							X		
A preliminary human study on bioavailability and efficacy of bioactive peptide IRW in egg white hydrolysate	16			X		X				
Aggressive and severe feather pecking in brown and white feathered Leghorn pullets: Will blue light during brooding and rearing cycle improve future egg production?	16	X					X			X

Completed research 2021-2022

Eggshell membrane nano-particles for biomedical applications

Dr. Maxwell Hincke, University of Ottawa

Mining the hen gastrointestinal microbiome for novel anti-infective probiotics to reduce the incidence of bacterial infections

Dr. Jennifer Ronholm, McGill University

Objective

The researchers sought to discover anti-infective novel probiotics in the intestine of laying hens that could reduce the incidence of bacterial infections, with the aim to eliminate or reduce the need and use of antibiotics.

Results

A total of 3,705 unique bacterial isolates were collected from healthy hens during the course of this study. There was great diversity between samples collected from the gut microbiome in laying hens, and specific types of isolates were associated with particular housing environments. From these samples, the researchers identified six isolates that can be used as probiotics to antagonize and fight pathogenic *Salmonella* in vitro. These six isolates will form the foundations of the first targeted, anti-infective probiotic for use in the poultry industry.

Cuticle proteins in diverse lines of hens

Dr. Bruce Rathgeber, Dalhousie University

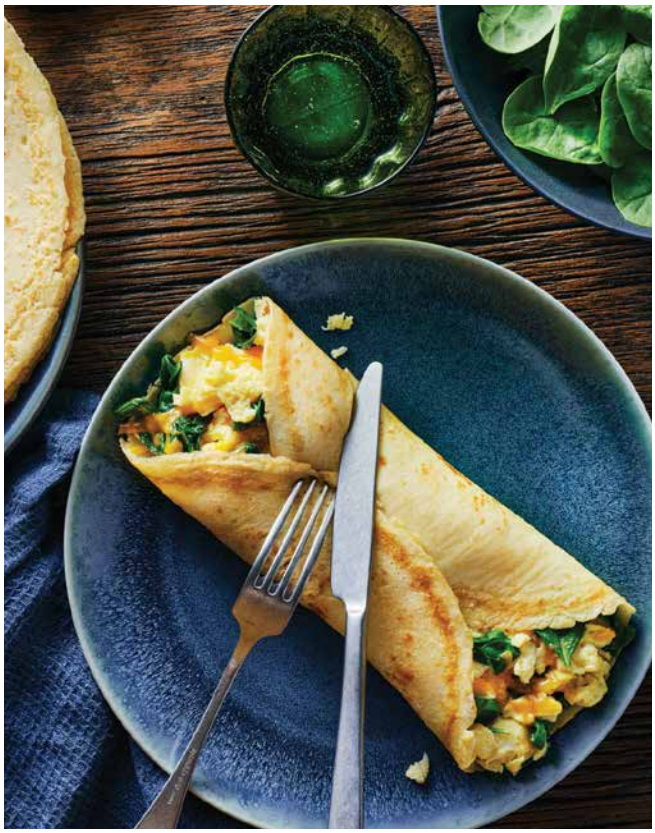
Objective

This project sought to determine the presence of antimicrobial proteins in the eggshell cuticle of eggs laid by hens from a wide range of genetic backgrounds, including both commercial and heritage breeds. The study also identified whether increased protection against *Salmonella* in some hens is related to the increased

presence of antibacterial proteins. The study further assessed if there is a relationship between cuticle proteins and shell matrix proteins that allows for optimal selection of shell proteins based on the cuticle protein profile.

Results

The project found that the amount of proteins in the eggshell cuticle is highest when hens are 50 weeks of age, after which it decreases. While the amount of proteins in eggs laid by young hens was higher in brown eggs, no strain differences were found following 50 weeks of age. Age also affected the type of proteins found in the cuticle, with eggs from young hens showing more variability and higher complexity of protein composition. Cuticle samples collected from heritage bird eggs showed improved protection against *Salmonella* penetration, indicating that there is a unique profile of proteins present in heritage eggs. Future studies will focus on identifying these proteins that contribute to the cuticle's bacterial resistance.



Get cracking for diabetes: An egg-based breakfast for improving blood glucose control in type 2 diabetes

Dr. Jonathan Little, University of British Columbia Okanagan

Objective

This study looked to determine if consuming an egg-based breakfast can improve glucose control and cardiometabolic health in people with type 2 diabetes when compared to a standard low-fat breakfast.

Results

Researchers followed two test groups: one that ate a low-carbohydrate, egg-based breakfast, and another that ate a low-fat, oatmeal and fruit smoothie-based breakfast. By the end of the three-month study, researchers noted a tendency towards reduction of the hemoglobin A1c (a measure of blood glucose control) in the low-carb, egg-based breakfast group, which suggests that blood sugar levels may have improved. Researchers also continually monitored glucose levels over the course of 14 days, noting that the group that ate a low-carb, egg-based breakfast had lower average blood sugar, and fewer spikes and crashes.

Altogether, the results of this clinical trial show that eating a low-carb egg-based breakfast appears to be a simple and easy dietary change for people with type 2 diabetes that can improve some aspects of blood sugar control.

Egg white-alginate based biomaterial for 3D tissue engineering

Dr. Simon Tran, McGill University

Research in progress

Precision feeding layers for improved uniformity, production and sustainability

Dr. Martin Zuidhof, University of Alberta

Objective

Researchers are using precision feeding to improve the uniformity of free run pullets and laying hens by feeding an optimal diet based on real-time body weight readings and reducing body size and frame size variation at the point of sexual maturity.

Development of strategies for control of avian influenza virus transmission

Dr. Shayan Sharif, University of Guelph

Objective

This project aims to develop vaccine formulations that can effectively control avian influenza (AI) virus shedding and be administered *in-ovo* or in feed, water or spray. The mucosal delivery vaccine platform that will be established in this research could be used for other types of poultry vaccines. This research will combine expertise in vaccine development and computer modelling to model the transmission of AI from vaccinated poultry to susceptible poultry and create a decision support system for the management of AI.

The role of omega-3 fatty acids in bone development in pullets: Investigating epigenomic response to breeder and perinatal nutrition

Dr. Elijah Kiarie, University of Guelph

Objective

This project will investigate the epigenetic, long-term effects of feeding breeder hens a diet enriched with omega-3 fatty acids on embryonic bone development. In addition, it will assess the subsequent effect on skeletal development and performance in breeder offspring, namely pullets and laying hens, and on pullet behaviour when they are subjected to stressors.

How much omega-3 fatty acids do hens require for optimal health and productivity?

Dr. James House, University of Manitoba

Objective

This project seeks to define omega-3 requirements for optimal health and performance in pullets and laying hens. To do this, the study will identify whether the type and level of the omega-3 fatty acids in the diet affect bird health and productivity. Additionally, it will determine the optimal quantity and type of omega-3 fatty acids to enhance immunity in pullets and laying hens to overcome an immune challenge induced by lipopolysaccharide, an inflammation-causing component of the cell wall of gram-negative bacteria.

A novel non-antibiotic strategy for controlling avian pathogenic *Escherichia coli* in laying hens

Dr. Dongyan Niu, University of Calgary

Objective

This study will evaluate the impact of plant tannins and bacteriophages to optimize the control of *Escherichia coli* in free run housing systems in lieu of using antibiotics.

Importance of eggshell cuticle quality for reducing bacterial adherence in table eggs

Dr. Maxwell Hincke, University of Ottawa

Objective

This project aims to identify the effect of hen age, strain and egg washing on eggshell quality and components of the eggshell cuticle. The study also looks to block bacterial adhesion and reduce pathogen contamination of table eggs.

Assessment of the impact of Canadian infectious bronchitis virus variants on egg production and fertility in laying hens

Dr. Faizal Careem, University of Calgary

Objective

The study will determine the economic impact of variant infectious bronchitis virus (IBV) strains that lead to egg production and quality problems in laying hens. This project also aims to propose mitigation strategies against IBV and to evaluate vaccines capable of protecting laying hens.

Determination of the metabolic triggers responsible for sexual maturation in laying hens and their relation to rearing environment and nutrition

Dr. Gregoy Bedecarrats, University of Guelph

Objective

This study aims to determine the body weight and body composition thresholds responsible for initiating sexual maturation in two strains of laying hens reared in different environments. Researchers will characterize the metabolic signals responsible for activating and inhibiting the reproductive axis and determine if this is impacted by different rearing environments, and if this impacts skeletal integrity.

Precision pullet rearing strategies for optimal reproductive body condition

Dr. Martin Zuidhof, University of Alberta

Objective

This project aims to optimize nutritional management for free run pullets and hens. Researchers will strive to understand the metabolic and physiological interactions that govern sexual maturation and lifetime egg production using precision feeding.

Egg yolk lecithin supplementation to improve pulmonary health: Implications for healthy individuals and individuals with chronic obstructive pulmonary disease

Dr. Mathieu Morissette, Institut universitaire de cardiologie et de pneumologie de Québec – Université Laval

Objective

This study will investigate the impact of egg yolk lecithin supplementation on pulmonary health, circulating phosphatidylcholine levels and lung function in healthy individuals and individuals with chronic obstructive pulmonary disease (COPD).

Develop new application of egg protein ovotransferrin as a functional food ingredient for bone health

Dr. Jianping Wu, University of Alberta

This research project is currently underway and an update will be provided in a future research summary.

Modified eggshell membrane formulations as a novel supplement to maintain gut health

Dr. Maxwell Hincke, University of Ottawa

This research project is currently underway and an update will be provided in a future research summary.

Optimization of vaccination strategies for laying hens controlling egg production problems induced by currently circulating infectious bronchitis virus variants

Dr. Faizal Careem, University of Calgary

Objective

This project seeks to optimize vaccination strategies against false layer syndrome, shell-less egg syndrome and other egg production abnormalities induced by select IBV variants isolated from laying hens. To do this, the researcher will test hens raised in Eastern and Western Canada using currently available IBV vaccines in Canada.

The fermentation of end-of-lay hen hydrolysate to produce pathogen-free microbiological-rich plant nutrient solutions

Mr. Marc Legault, Alberta Agriculture and Forestry

Objective

This study will demonstrate the value-added potential for end-of-lay hens by fermenting end-of-lay hen hydrolysate to produce an organic plant nutrient solution. Researchers will grow crops using this solution through commercial greenhouse techniques where crop productivity and soil health will be investigated.

The beneficial effect of egg-derived phosphatidylcholine on the obesity-related immune dysfunction

Dr. Caroline Richard, University of Alberta

Objective

Eggs are a source of phosphatidylcholine, a type of fat that is the major component of cell membranes that has been found to have a positive effect on immune function in humans. This project aims to understand the direct and indirect mechanisms by which egg phosphatidylcholine can counteract the negative effects of a high-fat diet and obesity on the function of T-cells (cells that play a role in immune response).

Animal implant studies with nano-textured eggshell-based constructs for bone regeneration

Dr. Maxwell Hincke, University of Ottawa

This research project is currently underway and an update will be provided in a future research summary.

Use of 3D kinematics and genomics to evaluate perching biomechanics in commercial and heritage strains of enriched colony housed pullets and laying hens

Dr. Clover Bench, University of Alberta

Objective

This study will assess the biomechanics of perching behaviour in pullets and laying hens using 3D kinematics to determine optimal phenotypes associated with specific genomic markers, stronger bones and better keel and foot health for hens housed in enriched colony systems.

Impact of alternative housing systems on layer health and egg production

Dr. Martine Boulianne, Université de Montréal

Objective

Data will be collected from commercial farms to understand the effect of enriched colony and aviary housing environments on laying hen health and welfare, air and litter quality and production parameters such as egg production, feed consumption and mortality.

Eggs as a strategy to maintain retina health in people with diabetes

Dr. Miyoung Suh, University of Manitoba

Objective

This project will investigate the effects of consuming lutein and omega-3 DHA-enriched eggs on retina health in people with diabetes. The results of this study will contribute to the development of prevention strategies for eye health in diabetic individuals.

Functional feedstuffs to bolster performance and immunocompetence of pullets reared at different rearing densities in enriched colony housing systems

Dr. Elijah Kiarie, University of Guelph

Objective

This study aims to understand the impact of functional feedstuffs (e.g. omega-3 fatty acids, yeast metabolites) on pullet growth, mortality, health and *E. coli* load in enriched colony housing systems at low and high stocking densities. Additionally, this project will examine the long-term effects of functional feedstuffs on laying hen performance and livability.

Optimization of environmental and hen welfare outcomes in Canadian egg production using predictive analytics (machine learning) techniques

Dr. Nathan Pelletier, University of British Columbia Okanagan

Objective

Researchers are aiming to optimize the sustainability of the egg industry by identifying animal welfare and environmental best practices through machine learning techniques. The results from this project will provide improvement opportunities and trade-offs to inform the ongoing housing system transition in Canada.

Determination of ideal perch space allowance for pullets

Dr. Karen Schwean-Lardner, University of Saskatchewan

Objective

This study will determine the minimum perch space requirements for pullets throughout rearing. Additionally, this project aims to determine the impact of perch space and genotype on growth and performance parameters, behaviour, bone strength, and keel bone damage.

The role of eggs in improving choline and DHA nutrition during development

Dr. Angela Devlin, University of British Columbia

Objective

This project seeks to understand the role of eggs on child development. Specifically, it will explore if a mother's egg consumption during lactation affects the nutrient composition of human milk, and the impact egg consumption has on dietary nutrient intake in children. This study will also investigate the cardiometabolic risk of egg consumption in women and children.

Sustainable composites from waste eggshells for practical applications

Dr. Duncan Cree, University of Saskatchewan

This research project is currently underway and an update will be provided in a future research summary.

Assessing hatchery related well-being

Dr. Karen Schwean-Lardner, University of Saskatchewan

Objective

The researchers look to provide evidence-based information to assist hatcheries with decision-making around equipment and transportation practices that promote chick welfare.

Development of novel and alternative approaches using small-RNA based immune-stimulant molecules for control of avian infectious bronchitis virus

Dr. Faizal Careem, University of Calgary

This research project is currently underway and an update will be provided in a future research summary.

Effect of LED flicker on the welfare, health, and production of pullets reared to 16 weeks and further impacts on hen performance and egg production and quality

Dr. Karen Schwean-Lardner, University of Saskatchewan

Objective

This longitudinal study aims to determine the impact of flickering LED lights on pullet and laying hen health, welfare, and performance including egg production and egg quality.

Impact on metabolic health of new ingredients enriched with active components derived from egg yolk

Dr Alain Doyen, Université Laval

This research project is currently underway and an update will be provided in a future research summary.

Understanding the social representations of meat, eggs and protein replacement products and their impact on food habits

Dr. Laurence Godin, Université Laval

Objective

The researchers intend to understand the role and social representations of alternatives to meat, eggs, and other animal proteins. This project will provide the egg industry with knowledge on emerging dietary trends and their impact on egg consumption practices.

Whole eggs for reducing inflammation and promoting muscle repair in adults with obesity

Dr. Michael De Lisio, University of Ottawa

Objective

This project seeks to understand if a short-term increase in whole egg consumption aids in muscle regeneration and reduces inflammation following exercise in obese adults.

Surveillance of egg yolk peritonitis (EYP) and causative *Escherichia coli* in Alberta egg farms

Dr. Dongyan Niu, University of Calgary

Objective

This study will determine the prevalence and impact of EYP in Alberta pullets and laying hens. Additionally, the researchers aim to genetically characterize EYP and determine risk factors associated with its existence.

A detailed characterization of particular matter in Canadian egg farms

Dr. Ran Zhao, University of Alberta

Objective

This study seeks to evaluate, optimize, and validate the use of low-cost air quality sensors in egg farms. Additionally, the researchers aim to understand the trend of dust and particulate matter in Canadian egg farms, particularly those with enriched colony and aviary housing systems. This includes identifying factors impinging on the concentration of dust and particulate matter and understanding the chemical composition and toxicological effect of particulate matter on egg farms.

Long-life layers: An environmental, economic, and animal welfare cost/benefit analysis

Dr. Nathan Pelletier, University of British Columbia Okanagan

Objective

This study will investigate and quantify the potential effects of extending lay cycle lengths on the environmental, animal welfare, and economic performance of egg production in Canada. The evaluation of these impacts can provide valuable information to Canada's egg farmers about the economic feasibility and sustainability implications of longer lay cycles.

The use of pecking blocks as foraging enrichment for improvement of feather condition in enriched colonies

Dr. Tina Widowski, University of Guelph

Objective

This project looks to determine the effect of pecking blocks on foraging behaviour, feather pecking, feather damage and beak shape, while also identifying the most effective placement of pecking blocks within an enriched colony housing system. Researchers will also note individual differences in frequency and duration of pecking block use among hens and will match this behaviour to health outcomes, including keel fractures, feather damage and eggshell quality. Finally, this study will establish whether the attraction to pecking blocks is related to its nutritional composition.

Pre-hatch sexing for chicks based on chorioallantoic membrane (CAM) immune-interrogation

Dr. Maxwell Hincke, University of Ottawa

This research project is currently underway and an update will be provided in a future research summary.

Egg versus whey protein as the optimal supplement for fitness-conscious people

Dr. Philip Chilibeck, University of Saskatchewan

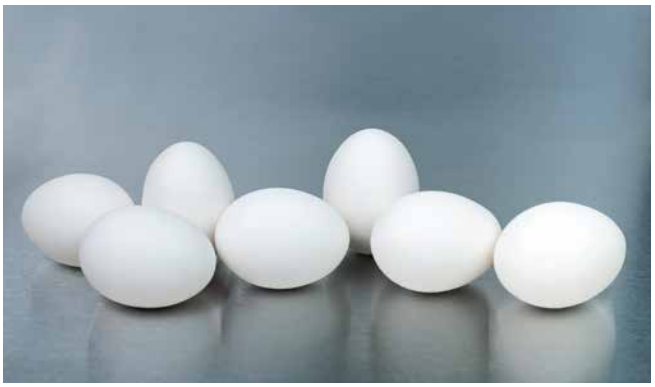
Objective

This study will evaluate the effectiveness of whole egg protein powder supplements compared to whey protein supplements in the diets of males and females aged 18-35 years old who are currently engaged in exercise training.

Cold plasma pasteurization of liquid whole eggs

Dr. Kevin Keener, University of Guelph

This research project is currently underway and an update will be provided in a future research summary.



Use of full-body imaging scans on live hens to develop a model describing the impact of body composition on sexual maturation

Dr. Gregoy Bedecarrats, University of Guelph

Objective

This project seeks to develop a standard operating procedure for using full-body imaging scans on live hens and monitor body composition changes during growth of pullets with a specific focus on adipose tissue accumulation and bone characteristics. The researchers will also determine the precise relationship between changes in body composition and the onset of sexual maturation throughout the development of pullets and will generate a model describing the physiological processes governing the impact of body composition on reproductive capacity and fitness. This model will provide the tools to predict growth and maturation of pullets and proactively implement on-farm adjustments to ensure nutrition and housing requirements are met during pullet growth.

Supplementation strategies in vitamin D to protect layers from vitamin D deficiency and immunological stress

Dr. Marie-Pierre Létourneau-Montminy, Université Laval

Objective

This study will test the addition of vitamin D to hen diets in a more active form, to the maximum allowed, for up to 90 weeks of laying. Researchers will specifically explore the impact of this diet on production performance, mineral levels, immune system, and bone health. With this project, the researchers look to improve the robustness of laying hens so that they can better cope with nutritional, immune, and environmental stresses in a context of longer laying cycles.

From eggshell wastes to key components in green energy storage and conversion

Dr. Zhi Li, University of Alberta

This research project is currently underway and an update will be provided in a future research summary.

Evaluation of hemp seed products to ameliorate fatty liver disease and reduce cannibalism in laying hens

Dr. Stephanie Collins, Dalhousie University

Objective

This study will look at the effect of feeding hemp by-products to laying hens, specifically assessing the impact on production performance, mortality rate, incidence of fatty liver disease, egg yolk cannabidiol (CBD) and fatty acid profile, feather pecking behaviour and incidence of cannibalism, and gut microbial populations. The researcher aims to provide recommendations for including hemp products in laying hen diets.

Manipulation of maturity with light during incubation

Dr. Bruce Rathgeber, Dalhousie University

Objective

Researchers will determine the impact of photoperiod length during incubation of hatching eggs on several factors, including: Hatch success and timing of hatch, early post-placement feed and water intake, recovery from long distance transportation, age at first egg, overall performance over a production period, egg number and egg size, and bone health in the long term. This project will provide data to further the knowledge of potential benefits of using lights in incubators.

Expanding opportunities for Western Canadian fava bean (*Vicia faba*) as a feedstuff for laying hens

Dr. Doug Korver, University of Alberta

Objective

This project seeks to understand the nutritional characteristics of Canadian fava beans and incorporate them into feeding programs for laying hens in a way that minimizes impacts on productivity and bird health.

Role of omega-3 eggs in reducing pro-oxidative and inflammatory effects of omega-6 poly-unsaturated fatty acids (PUFA) in diabetic and geriatric hearts

Dr. Sanjoy Ghosh, University of British Columbia Okanagan

Objective

Cardiovascular disease is the leading cause of morbidity and mortality in both older and diabetic patients, due to the loss of antioxidants such as glutathione (GSH). The researchers aim to determine whether regular whole eggs or omega-3 PUFA enriched eggs can improve cardiac GSH, elevate circulating omega-3 PUFA levels and attenuate both inflammation and oxidative stress.

Perching requirements for pullets and laying hens: Preferences for grasping and elevation

Dr. Tina Widowski, University of Guelph

Objective

There are different understandings about what structures can be used as perches for laying hens, particularly in structures where hens cannot wrap their toes around the structure. To provide greater context to perching requirements, this study aims to explore hens' motivation for grasping and elevation, as well as how motivation for perching develops in pullets and if health conditions in older birds affects their roosting preferences. Additionally, the researchers will determine if strain differences affect these preferences.

EGGS-actly what's required: Eggs as an appealing way to restore nutritional status after cancer treatment

Dr. Vera Mazurak, University of Alberta

Objective

This project will use an egg-based diet to promote adequate intake of high-quality protein, maintain weight and muscle mass, enhance immune function and improve food related quality of life for people who have received chemotherapy treatment.

Building a usable surveillance and monitoring tool for avian influenza outbreaks in Canada

Dr. Rozita Dara, University of Guelph

This research project is currently underway and an update will be provided in a future research summary.

Understanding feather pecking in laying hens: The gut-microbiome-brain connection II

Dr. Alexandra Harlander, University of Guelph

Objective

The researchers seek to identify a simple, practical prebiotic nutraceutical that can prevent or reduce feather pecking in laying hens on Canadian farms. To do this, they will use a galacto-oligosaccharide prebiotic and investigate its efficacy, effectiveness, and its potential mode of action.

An integrated process for recovering calcium carbonate and collagen/collagen amino acids from waste shells

Dr. Duncan Cree, University of Saskatchewan

This research project is currently underway and an update will be provided in a future research summary.

From potential to implementation: Evaluating alternatives to antibiotics in layers through coordinated in vivo experimental studies and barn-level surveillance with industry partners

Dr. Nicole Ricker, University of Guelph

Objectives

For this project, the researchers will identify changes in cecal microbiota short-chain fatty acid production (e.g. lactate) in response to acidification administered through either feed or water additives, as well as noting biomarkers or easy-to-measure physiological indicators that could confirm the success of the acidification treatment. The researchers will then partner with industry to observe and validate, at the barn level, the use of biomarkers and the effectiveness of water acidification and protected feed acidifier on avian pathogenic *E. coli* shedding and colonization.

Upcoming research projects

Towards circular manufacturing strategies for the egg industry using eggshells as value-added mortar filler material for large-scale additive manufacturing

Dr. Lucas Hof, École de technologie supérieure

Including egg protein as part of a plant-based dietary pattern improves cardiometabolic health by ameliorating fatty liver disease

Dr. Carla Taylor, University of Manitoba

Objective

People with excessive accumulation of fat in liver cells frequently develop type 2 diabetes, cardiovascular disease, and liver cancer. The researchers will use several high protein diets containing whole egg protein or egg white protein, singly or in combination with plant-based protein, and compare these to a plant-based protein

diet alone. They will examine the effects of these diets on liver fat accumulation, adipose tissue, insulin resistance, blood pressure and gut microbiome of a rodent model of fatty liver and carbiometabolic disease.

Egg residue depletion of oral topical formulations of Fluralaner (Bravecto™) in laying hens

Dr. Patricia Dowling, University of Saskatchewan

Objective

Canadian small flocks lack affordable and convenient treatment options against one of the most significant ectoparasite pest in poultry, the red mite. This project will determine if canine or feline formulations of Fluralaner, given orally or applied topically respectively, would have similar residue depletion in eggs as the soon-to-be-approved poultry formulation Exholt™ and therefore would be suitable for small flock use to treat and control red mites.

Antimicrobial peptides: A better alternative to antibiotics on egg farms

Dr. Inanc Birol, Michael Smith Genome Science Centre

A preliminary human study on bioavailability and efficacy of bioactive peptide IRW in egg white hydrolysate

Dr. Jianping Wu, University of Alberta

Objectives

IRW is a bioactive peptide present in eggs that has shown potential health effects against hypertension, type 2 diabetes, insulin resistance, oxidation, and inflammation. However, its bioavailability and efficacy in humans has yet to be studied. Here, the researchers seek to perform

a preliminary human study to test the bioavailability and efficacy of IRW in egg white hydrolysate in lowering blood pressure and blood glucose.

Aggressive and severe feather pecking in brown and white feathered Leghorn pullets: Will blue light during brooding and rearing cycle improve future egg production?

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Objectives

Aggressive feather pecking and cannibalism are significant issues affecting animal welfare and production on egg farms. This study will determine whether the use of blue light alters behaviour in brown and white feathered Leghorn pullets, resulting in reductions in aggressive pecking compared to birds reared under white light. In addition, the researchers will assess if using blue light during the brooding and rearing period close to the age of sexual maturation has a lingering effect on egg production when birds transition to white light at either 15 or 17 weeks of age.