Ontario Ginseng Innovation & Research Consortium

OGIRC

2nd ANNUAL CONFERENCE 2009

November 6 – 7, 2009

London Hall,

The University of Western Ontario

New Technologies for Ginseng Agriculture and Product Development

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Agriculture et
Agroalimentaire Canada

Program Overview

November 6 - 7, 2009

Day 1		Day 2	
12:00 pm	**Registration & Poster Viewing, Judging I**	**8:30 am**	**Registration**
1:00	**Welcome and Introduction**		
1:10 - 2:30	**Session I - Plant Biotechnology, Agriculture & Phytochemistry** *D. Brown; P. Saxena; J.T. Arnason; A. Ebied*	**9:00**	**Session VI – Preclinical Study (continued)** *M. Bakovic; D. Mutch; D. Ma; C. Carruthers and K. Rogers*
2:30 – 3:50	**Session II - Preclinical Study** *E. Lui; Q. Madrenas, G. Hewson, J. Toth and L.A. Chau; J. Trevithick, T. Dzialoszynski and M. Estaki; S. Chiu*	**10:20**	**Break**
		10:40	**Session VI continued** *S. Chakrabarti; M. Barnes and L. Coolen; Z. Suntres; D. LI, W. Yu, S. Pasyk, E. Lui; C. Bear*
4:00 – 5:00	**Session III - Trainee-led Session**	**12:00 – 1:00**	**Lunch, Annual General Meeting, Poster Awards**
5:00	**Reception & Mixer** **Poster Viewing & Judging II**	**1:00 – 1:20**	**Session VII** **Advanced Processing** *J. Zhu*
5:30 – 6:45	**Session IV - Plenary lecture and discussion forum on metabolomics** Dr. Wei Jia Panelists – J. Arnason, D. Ma	**1:20 – 2:20**	**Session VIII – Commercialization** *G. Leong; D. Sharp; OGGA*
		2:20 – 3:00	**Conclusion** **Moving Forward**
6:45 – 8:00	**Session V** Poster Presentations & Judging III		

PROGRAM AGENDA – Day 1

Friday, November 6		
12.00 pm		**Registration and Poster Viewing & Judging I**
1.00 pm		**Welcome and Introduction**
1.10 – 2.30	**Session I**	**Plant Biotechnology, Agriculture & Phytochemistry**
	1.10 – 1.30	D. Brown: North American Ginseng germplasm and cultivar development
	1.30 – 1.50	P. Saxena: Developing temporary immersion bioreactor technology for rapid growth of ginseng
	1.50 – 2.10	J. Arnason: Genotyping by NMR and phytochemical correlates
	2.10 – 2.30	A. Ebied, PolyAnalytik Inc. / Viscotek Corporation: Challenges in quantitative analysis of polysaccharides
2.30 – 3.50	**Session II**	**Preclinical Study**
	2.30 – 2.50	E. Lui: An overview of the efficacy of ginseng
	2.50 – 3.10	Q. Madrenas, G. Hewson, J. Toth and L. Chau: Modulation of human immune responses by ginseng extracts.
	3.10 – 3.30	J. Trevithick, T. Dzialoszynski, and M. Estaki: Ontario Ginseng: Antioxidant, exercise , diabetes, cataract effects
	3.30 – 3.50	S. Chiu: Ginseng CNS pharmacology: From stress buffer studies to discovery of ginseng as a lead compound in anti-depressant therapy
4.00 – 5.00	**Session III**	**Trainee-led Session** Breeding program to improve Ontario ginseng products
5.00 pm		**Reception & Mixer** **Poster Viewing & Judging II**
5.30 – 6.45	**Session IV** **Chair:** E. Lui	**Plenary lecture and discussion forum on metabolomics** Dr. Wei Jia Center for Research Excellence in Bioactive Food Components, University of North Carolina (Greensboro) "*Application of Metabolomics to Medicinal Plant Research*" Panelists: J. Arnason, K. He
6.45 – 8.00	**Session V**	**Poster Presentations/Discussion & Judging III** S. Chakrabarti, Chair

*For speaker affiliation, please see registrants list in program

Plenary Lecture

Wei Jia, Ph.D.
Professor of Nutrition
University of North Carolina – Greensboro
Principal Investigator and Co-Director
UNCG Center for Research Excellence in Bioactive Food Components

"Application of Metabolomics to Medicinal Plant Research"

Abstract

It has been a challenging task to evaluate the systemic pharmacological effect of medicinal plants containing multiple phytochemical components in the context of single-target based pharmacological models. Metabolomics, defined as the measurement of multiparametric metabolic responses of a biological compartment or a living system to pathophysiological stimuli or genetic modification, is a newly thriving systems biology which has been highly favored in botanical science and toxicological studies.

Chinese ginseng, an ancient medicinal herb with a worldwide reputation for maintaining good health, has been extensively used in many prescriptions as a tonic to increase resistance to fatigue and stress. However, most of its claimed effects can not be readily evaluated in modern pharmacological models. The ginseng extracts contain more than 50 known compounds, mainly, ginsenosides. We demonstrated that ginseng extracts were able to attenuate alterations in several metabolic pathways in response to acute cold stress and chronic unpredictable mild stress, using a combined chemical profiling and metabolic profiling approach. The results indicate that comprehensive molecular descriptions of a pathophysiological state and the response to drug intervention can be achieved, so that the global biochemical changes contributing to a disease or drug response can be taken into account, leading to a systems-level understanding of the drug efficacy, toxicity and mechanisms of action.

Biography

Dr. Wei Jia is professor of Nutrition at the University of North Carolina at Greensboro (UNCG) and co-director of The UNCG Center for Research Excellence in Bioactive Food Components, located at the North Carolina Research Campus in Kannapolis. He was previously professor of Natural medicines and vice dean, School of Pharmacy, Shanghai Jiao Tong University. In addition, he was director of the Center for Traditional Chinese Medicine and Systems Biology within Shanghai University of Traditional Chinese Medicine, a program with special emphasis on the synergy between multi-component drug and food research.

Dr Jia completed his M.S. and Ph.D. at the University of Missouri-Columbia in the field of Radiopharmaceutical Chemistry. He has supervised more than 30 M.S. and Ph.D. thesis projects. He is the author of over 130 scientific papers and three books, and the speaker of over 30 invited lectures and talks at major life sciences and pharmaceutical-based conferences and institutes. He is also the member of the editorial board for 10 scientific journals mainly in the field of botanical drugs and Traditional Chinese Medicine (TCM). Dr. Jia provides expertise to the China State Food and Drug Administration on botanical drugs/TCM agent evaluation and coordinator for the International Science and Technology Cooperation Program on TCM.

Dr. Jia's current research focuses on the identification and characterization of bioactive components from plants and TCM concerning metabolic disorders. He utilizes global metabolic and chemical profiling approaches as a way to scientifically bridge different pharmaceutical and nutritional concepts and methodologies. A top-down or "from whole to parts" strategy is taken in his research to capture the holistic and dynamic variations of biological systems in response to environmental stimuli or drug intervention, and to elucidate the underlying mechanisms of disease onset and pathophysiological development.

Poster Abstracts

Judges Committee

Chair – Dr. Subrata Chakrabarti
Department of Pathology, Western

Dr. Marica Bakovic, Human Health & Nutritional Sciences, University of Guelph; Dr. Zacharias Suntres, Medical Sciences, Northern Ontario School of Medicine; Dr. John Ciriello, Department of Physiology and Pharmacology,Western; Dr. Paul Charpentier, Department of Chemical & Biochemical Engineering, Western

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Poster Abstract

Poster Status	Presentation /Discussion Only ☐ Judge ☑	POSTER # 1
Presenter Name: **Position:** **PTG:** **Supervisor** **Affiliation:**	Sijun Zhou Post-doctoral Fellow Plant Biotechnology Dan Brown Southern Crop Protection and Food Research Centre, Agriculture and Agri-Food Canada; the University of Western Ontario	
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Title: Micropropagation of North American Ginseng

Co-Author(s): N/A

Abstract:

A new efficient protocol for micropropagation of North American ginseng has been developed based on an established six-step *in vitro* tissue culture system (Sijun Zhou and Dan Brown, 2006). One- to two-week-old seedlings were used as starting material for micropropagation. Cotyledons and hypocotyls were incised from the seedlings and placed onto MS medium containing 1mg l^{-1} 2, 4 – D and 1mg l^{-1} NAA. Seedlings from ½ MS containing 0.5 mg l^{-1} GA3 and 0.1 mg l^{-1} BA give the best results. Compared to the old protocol (embryos were induced from stratified cotyledons on MS medium without regulators), the frequency, number and quality of embryos induced from seedling explants are higher. Embryogenesis frequency of seedling explants was 95% (old protocol: 70%). Embryos from seedling explants are separate from each other and separate from explants. Quality of somatic embryos was improved by placing cotyledonary-stage embryos on a new maturation medium (½ MS containing 0.5% activated charcoal and 3% sucrose) and incubating for a prolongated period (2 to 4 months) at lowered temperature (15 ^{0}C). With the new efficient protocol, 200 lines have been established, 20 to 200 plants and a large number of embryos each line. Phytochemical and molecular analysis of the lines is ongoing.

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Poster Status	Presentation /Discussion Only ☐ Judge ☑	POSTER # 2
Presenter Name: **Position:** **PTG:** **Supervisor** **Affiliation:**	VS Binhu Post-doctoral Fellow Plant Biotechnology Dan Brown Southern Crop Protection and Food Research Centre, Agriculture and Agri-Food Canada; the University of Western Ontario	
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Title: Developing genetic fingerprints for *Panax quinquefolius* for early-stage screening and production of synthetic cultivars

Co-Author(s): Sijun Zhou, Dan Brown

Abstract:

American ginseng (*Panax quinquefolius* L.) is one of the most widely used herbal remedies in the world, in which the major bioactive constituents are ginsenosides. The major bioactive components of American ginseng are triterpene saponins known as ginsenosides. Despite being the 5th major cash crop in Ontario, there has been little genetic improvement, impeded by the long production cycles. Quality control issues (ginsenosides) have not been resolved. Using a recently developed micro-propagation method, we have developed over 100 clonal lines of ginseng. These lines will be subject to metabolic and transcript profiling using the next-generation sequencing (NGS) technologies. We anticipate discovering polymorphisms and several putative genes responsible for the 'traits' and biosynthesis of ginsenosides in medicinal plants by deep sequencing of the transcriptome. Information derived will constitute an important resource for genetic improvement of North American ginseng.

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Poster Status	Presentation /Discussion Only ☑ Judge ☐	POSTER # 3
Presenter Name: **Position:** **PTG:** **Supervisor** **Affiliation:**	Yuan Liu Visiting Scientist Pre-Clinical Ed Lui Dept. Physiology and Pharmacology, The University of Western Ontario	
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Title: Influence of the age and growth season on the organizational structure and ginsenoside levels of roots from *Panax quinquefolium* L. grown in Ontario, Canada

Co-Author(s): Jirui Hou, Hua Pei, Chike Azike, EMK Lui

Abstract:

Radix Panacis Quinquefolii, which is ranked as one of the top selling herbs in the world, has notable clinic effect on curing chronic disease and enhancing immune competence. However, there are still some issues about the influence of the age and growth season on the organizational structure and ginsenoside levels of roots from *Panax quinquefolium* L. grown in Ontario, Canada that need to be addressed.
We will report on the findings of 2-4 year old fresh plants and dried roots of *Panax quinquefolium* L. grown in Southwestern Ontario. Morphological examination of fixed tissues of roots showed the presence of phellem layer, cortex, phloem and cambium xylem. The abundance of calcium oxalate cluster crystals and the secretory canal were increased and piling up with an incremental scale in parenchyma cell of cortex layer from 2 to 4 year-old roots. There was also an age-related difference in vessel quantity and its degree of lignification formation.

Phytochemical analysis of aqueous and alcoholic extracts of ginseng roots showed the presence of Rg1, Re, Rb1, Rc, Rb2 and Rd. The total ginsenosides levels of aqueous and alcoholic extracts from 2-4 year-old roots showed an initial increase in May, then a decrease from June, but increased gradually again from July to October. The total ginsenosides contents of alcoholic extracts were higher than those of the aqueous extracts derived from plants at the same stage of development. The total content of aqueous and alcoholic extracts of 3 year-old- roots was higher than those of the 4 year-old roots derived from plants collected in Sep. and Oct.
The results of the phytochemical analysis of the current study are not consistent with some literature reports and local harvesting practice of collecting 4 year-old roots for the market, although the organizational structure showed typical age-related changes. Additional studies with roots collected from other locations will be required to confirm the results.

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Poster Status	Presentation /Discussion Only ☐ Judge ☑	POSTER # 4
Presenter Name:	Kristina McIntyre	
Position:	Graduate Student	
PTG:	Phytochemistry	
Supervisor	John Arnason	
Affiliation:	Department of Biology, University of Ottawa	

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Title: Ginsenoside variation within and between Ontario ginseng (*P.quinquefolius*) landraces

Co-Author(s): N/A

Abstract:

Ginsenoside content (%w/w) for 6 major ginsenosides was assessed within individual Ontario landraces and between five landraces using HPLC-DAD analysis. In individual landraces, the greatest range in total ginsenoside content was 4.35- 12.16% w/w and the lowest range was 4.24- 10.23% w/w.

All ginsenosides, except Rg1, varied significantly between at least two landraces and total ginsenoside levels were reduced in one landrace ($p<0.05$). Ginsenoside composition was similar between all landraces with Rb1>Rd=Re>Rc>Rg1>Rb2. The use of NMR to rapidly distinguish between ginseng species was also investigated. This technique was used successfully to differentiate *Panax ginseng* and *Panax quinquefolius*. There is potential for NMR analysis to rapidly differentiate ginseng landraces, which is currently being assessed.

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Poster Status	Presentation /Discussion Only ☐ Judge ☑	POSTER # 5
Presenter Name: **Position:** **PTG:** **Supervisor** **Affiliation:**	Robert Bi Post-doctoral Fellow Advanced Processing Jesse Zhu Chemical & Biochemical Engineering, University of Western Ontario	
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Title: Application of powder technology in the research of value added Ontario ginseng products

Co-Author(s): N/A

Abstract:

North American ginseng produced in Canada accounts for more than 60% of world's market, and the majority of Canada ginseng is grown in Ontario, which is the largest North American ginseng producer. There are dozens of different ginseng products in the current market; however, most of them are original ginseng roots, traditional water extracts, and ginseng chips. Such traditional products not only are inconvenient for administration, but also have relative low bioavailability compared with some new dosage forms. To overcome these shortcomings, some new powder technologies are applied in the processing of ginseng product to improve its bioavailability and convenience. The results have shown that original ginseng roots can be grinded to fine powder with a particle size ranges from 20um to 50um through a high pressure air jet mill. The dissolution rate and bioavailability of such fine ginseng powders are promoted patently compared to those of sliced ginseng or large ginseng powders. Additionally, a new chewable tablet made from the fine ginseng powder presents a more convenient and comfortable feeling for patients. To provide more choice for customers, ginseng extracts also can be made into the above mentioned chewable tablets or instant soluble granular particles, which may make ginseng products more acceptable to seniors and First Nations people.

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Poster Status	Presentation /Discussion Only ☑ Judge ☐	POSTER # 6
Presenter Name:	Marica Bakovic	
Position:	Investigator	
PTG:	Pre-Clinical	
Supervisor:	N/A	
Affiliation:	Department of Human Health & Nutritional Sciences, University of Guelph	

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Title: Studies on the hypolipidemic activities of ginseng in the Pcyt2 mouse model for the metabolic syndrome

Co-Author(s): N/A

Abstract:

We have generated the CTP:phosphoethanolamine cytidyltransferase deficient mice (*Pcyt2*$^{+/-}$) which develop characteristics of the human metabolic syndrome at adult stage. This model has proven to be useful for studying the mechanisms that underlie the primary beneficial effects of ginseng treatments on the alleviation of the metabolic syndrome phenotype, including the age-dependent obesity, hyperlipidemia, liver steatosis and insulin resistance.

The central mechanism causing the metabolic syndrome phenotype in *Pcyt2*$^{+/-}$ mice represents an elevated formation of lipid (diacyl- and triacylglyceride-TAG) stores in liver, adipocytes and muscle, and a reduced utilization of fatty acids in mitochondria for energy production. The *Pcyt2*$^{+/-}$hypertriglyceridemia is a result of increased intestinal fatty acid absorption and decreased VLDL-TAG clearance from the plasma, in an agreement with significantly elevated liver (and perhaps intestine) fatty acid uptake and reduced hepatic lipase and lipoprotein lipase activities. After orally administering ginseng for four weeks, Pcyt2 deficient mice experience an extensive reduction in liver TAG accumulation and an increased TAG deposition in adipose tissue. Such beneficial effects on liver steatosis will be further investigated in two separate trials, 4-weeks and 10 months, to further establish the effect of ginseng treatments on general lipid metabolism, lipoprotein secretion, lipogenic gene expression and regulation of insulin signaling pathways in tissues and plasma, preventatively and during the process of disease progression.

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Poster Status	Presentation /Discussion Only ☐ Judge ☑	POSTER # 7
Presenter Name: **Position:** **PTG:** **Supervisor:** **Affiliation:**	Branden Deschambault Graduate Student Pre-Clinical Marica Bakovic University of Guelph	
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Title: Potential alleviation of the metabolic syndrome phenotype in Pcyt2 deficient mice with North American ginseng (*Panax quinquefolius*)

Co-Author(s): N/A

Abstract:

CTP: phosphoethanolamine cytidyltransferase (Pcyt2) catalyzes the formation of CDP-ethanolamine, which is combined with diacylglycerol to form phosphatidylethanolamine in the final step of the Kennedy pathway. We have generated Pcyt2 deficient mice (Pcyt2+/-) that display the main features of the metabolic syndrome in humans, including adult-onset obesity, hepatic steatosis, glucose intolerance and hypertriglyceridemia. Here we report on the preliminary delineation of the beneficial effects of a North American ginseng (*Panax quinquefolius*) root ethanol extract in the Pcyt2+/- deficient mouse phenotype. During a 4 week pilot trial, Pcyt2 deficient mice and littermate controls were orally treated with 200 mg/kg/day ginseng extract in saline or saline only. Possible effects of ginseng were investigated on food intake, 24-hour fasting weight loss, plasma and liver triglyceride content, plasma cytokines, and visceral fat pad mass. The most prominent effect of ginseng treatments was an alleviation of the Pcyt2+/- mice fatty liver (hepatic steatosis) and an increase in the mass of visceral adipose tissue. As a means of further probing of these suggestive findings, gene expression regulating hepatic de novo lipogenesis and beta-oxidation, as well as adipogenesis in visceral adipose tissue, will be investigated. Furthermore, a larger trial in which the ginseng extract will be chronically administered to Pcyt2 deficient mice at the identical dose will soon be underway.

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Poster Status	Presentation /Discussion Only ☐ Judge ☑	POSTER # 8
Presenter Name:	Ratnesh K.Singh	
Position:	Post-doctoral Fellow	
PTG:	Pre-Clinical	
Supervisor:	Marica Bakovic	
Affiliation:	Department of Human Health & Nutritional Sciences, University of Guelph	

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Title: Mechanisms of hypertriglyceridemia in CTP: phosphoethanolamine cytidylyltransferase *(Pcyt2*) deficient mice

Co-Author(s): Morgan D.Fullerton

Abstract:

This study aimed to elucidate the mechanisms of hypertriglyceridemia in CTP:phosphoethanolamine cytidylyltransferase heterozygous mice (*Pcyt2*$^{+/-}$). Since *Pcyt2*$^{+/-}$ mice experience no change in hepatic VLDL secretion, the observed hypertriglyceridemia can result from an increased intestinal lipid absorption and/or from a decreased triglyceride (TG) clearance from plasma. Lipid absorption was studied by an intravenous injection of Triton P-407 and an intragastric load of glycerol tri [^{3}H] oleate (TO). It was established that the rate of appearance of [^{3}H] TO was higher in *Pcyt2*$^{+/-}$ mice than in control littermates. Plasma TG clearance and tissue absorptions were studied by injecting [^{3}H] TO-VLDL like particles via the inferior vena-cava into anesthetized mice. [^{3}H]TO VLDL-like particles disappeared slowly from the *Pcyt2*$^{+/-}$ plasma demonstrating that *Pcyt2* deficiency also caused reduced lipolytic conversion of plasma TG and concomitantly a decreased radiolabel appearance in various tissues, including liver, white adipose tissue, kidney, muscles and heart. Plasma and tissue hepatic lipase and lipoprotein lipase activities were significantly reduced in Pcyt2$^{+/-}$ mice relative to control littermates.

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Poster Status	Presentation /Discussion Only ☐ Judge ☑	POSTER # 9
Presenter Name: **Position:** **PTG:** **Supervisor** **Affiliation:**	Subhrojit Sen Post-doctoral Fellow Pre-Clinical Subrata Chakrabarti Department of Pathology, University of Western Ontario	
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Title: Antimicrobial effects of ginseng extracts

Co-Author(s): Shali Chen, Biao Feng, Yuexiu Wu, Kara McArthur & Subrata Chakrabarti

Abstract:

Diabetes mellitus consists of a heterogeneous group of clinical conditions with elevation of the blood glucose level as a central feature. Overall 40% of diabetics develop long-term complications affecting various organs including kidney, heart and retina. Oxidative stress contributes to the pathogenesis of various diabetic complications. The herb Ginseng (Araliaceae), demonstrates widespread biological effects because of its antioxidant and other properties. Ginsenosides, its active components, are found mainly in the roots. The present study was undertaken to investigate the effects of ginseng on glucose-induced changes in human vascular endothelial cells (HUVECs). We further extended our investigation to study the preventive effects of ginseng on diabetes-induced renal damage. HUVECs were incubated with 25 mM glucose for 24 hrs with or without Ginseng (ethanolic extract). For *in vivo* experiments we used C57BL mice with STZ-induced diabetes. Diabetic mice were treated with ethanolic extract of ginseng (200 mg/Kg body wt, oral gavage, 2 months). Treatment of HUVECs with ginseng caused significant diminution of glucose-induced fibronectin (FN), EDB^+ FN (its splice variant), endothlin-1 (ET-1) and vascular endothelial growth factor (VEGF) mRNA levels. Ginseng further prevented glucose-induced increase in FN protein levels and oxidative stress as detected by 8-OHDG. Diabetic mice treated with ginseng showed significant reduction of fasting blood glucose, glycated hemoglobin, urinary albumin and creatinine levels compared to the untreated diabetic animals. In the kidneys of diabetic animals, ginseng significantly reduced diabetes-induced FN, ET-1, EDB^+ FN, VEGF and TGF-β mRNA upregulations. These results suggest that ginseng prevents pathogenetic processes leading to chronic diabetic complications, through its antioxidative and antihyperglycemic properties.

Acknowledgment:
Supported by grant from Ministry of Research & Innovation, Ontario Research Fund – Research Excellence

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Poster Status	Presentation /Discussion Only ☐ Judge ☑	POSTER # 10
Presenter Name: **Position:** **Supervisor:** **Affiliation:**	Anita Prtenjaca Post-doctoral Fellow Kathleen Hill Department Biology, University of Western Ontario	

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Title: The *Harlequin* Carrier Mouse (hqX): a New Model for Aging-Associated Retinal Degeneration

Co-Author(s): Alex M. Laliberte, Thomas M. MacPherson, Cindy M. Hutnik

Abstract:

With the rising prevalence of aging-related neurodegenerative diseases, the development of a sensitive framework for assessing novel treatments is increasingly important. Retinal and cerebellar neurons are highly susceptible to aging-related neurodegeneration, making their structural and functional deficits attractive biomarkers for monitoring treatment efficacy. The *harlequin* disease mouse (*hqhq* and *hq*Y genotypes) is a model of premature aging and neurodegeneration, characterized by retinal and cerebellar granule neuron degeneration. The *hq* disease mouse contains a proviral insertion into the apoptosis-inducing factor (*aif)* gene on the X-chromosome, reducing AIF function by 80%. AIF acts at the mitochondrion to scavenge free radicals and *hq* disease mice show elevated oxidative stress and DNA damage early in development. Another model for normal aging-associated retinal disease is the female *harlequin* carrier (*hq*X). We hypothesize that the *hq* carrier may display later onset *harlequin* phenotypic features and be a closer mimic of human aging-associated neurodegeneration more amenable to preventative interventions. Age-matched hqX and wild type (WT) mice at young (3 months of age; moa) and old age (14 to 16 moa) were assessed for phenotypic features associated with neurodegeneration to determine onset and severity of disease (n=6 mice in each cohort). *In vivo* tests of retinal function, whole eye structure and cerebellar degeneration were conducted using electroretinography (ERG), Optical Coherence Tomography (OCT) and infrared actimeters for locomotion, respectively. Data were analyzed using ANOVA. Retinal function deficits are evident in *hq*X compared to WT mice at 3 moa ($p=0.005$). Both *hq*X and WT mice show deficits in retinal function in advanced age ($p<0.001$ and $p=0.003$, respectively). In old age, *hq*X mice have significantly reduced retinal function compared with age-matched WT mice ($p=0.001$). Greater locomotor activity associated with ataxia is observed in old *hq*X mice compared to WT mice ($p=0.012$), but not in the younger cohort. OCT shows similar retinal integrity in young mice but significant retinal thinning in *hq*X compared with WT mice ($p=0.018$).

The *hq* carrier is a later onset retinal degenerative disease model permitting preventative interventions. ERG assessment is highly sensitive, with slight vision deficits measureable at 3 moa in *hq*X mice. OCT provides longitudinal assessment of whole eye structure sensitive to retinal thinning in old age. Locomotor activity is a useful biomarker for *hq*X cerebellar degeneration in old age. Both OCT and locomotor activity require independent confirmation of neurodegeneration using H&E staining of cross sections of the eye and cerebellum. Herein, we successfully identify a second framework for *in vivo*, longitudinal evaluation of neurodegeneration using multiple phenotypic biomarkers in a mammalian model of human aging-associated disease. The *hq* disease and carrier mice are excellent models for testing efficacy of ginsenosides in ameliorating neurodegenerative disease.

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Poster Status	Presentation /Discussion Only ☐ Judge ☑	POSTER # 11
Presenter Name: **Position:** **PTG:** **Supervisor** **Affiliation:**	Jirui Hou Post Doctoral Fellow Pre-Clinical Ed Lui Department of Physiology and Pharmacology, University of Western Ontario	
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Title: Effect of NA Ginseng on Oxidant Stress and Vascular Function

Co-Author(s): Hua Pei, Chike Azike, Yuan Liu, Edmund MK Lui

Abstract:

Ginseng has a long history of cultural use and it has been recognized as a multi-action herb. There are many theories and claims describing the efficacy of ginseng, which can combat stress, enhance immune system, protect cardiovascular function.

In this presentation, we will report on the findings on the modulation of vascular effects of 4 year-old Ontario-grown ginseng focusing on the activity between aqueous (AQ) and organic (OR) extracts and current studies:

1. Modulation of vascular reactivity. AQ extract produced concentration-dependent relaxation of pre-contracted aortic rings, the magnitude was similar to that induced by acetylcholine (Ach) and was more effective than OR extract. AQ extract was also effective in preserving vascular contractility lost to processing and tissue culturing conditions.
2. Effect of ginseng on oxidative stress and vascular injury. In vitro studies endothelial cells and aortic rings injury induced with homocystine or H2O2 and ginseng protection will be assessed by determine ROS and NO production and an organ bath based bioassay respectively. In vivo studies rats will be treated with homocysteine in drinking water and ginseng extracts will be administered by gastric gavage daily for 42 days. Blood and aorta will be collected for the examination of cytokines, GSH and isoprostane (oxidant stress marker). Major organs will be fixed for histological evaluation.

These pharmacological studies will be discussed with reference to the phytochemical profile of the extracts and the potential application to vascular diseases.

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Poster Status	Presentation /Discussion Only ☐ Judge ☑	POSTER # 12
Presenter Name: **Position:** **PTG:** **Supervisor** **Affiliation:**	Chike Azike Graduate Student Pre-Clinical Ed Lui Department of Physiology and Pharmacology, University of Western Ontario	
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Title: Effect of NA Ginseng on Oxidant Stress and Vascular Function

North American Ginseng has been used as an important medicinal plant for over 400 years in traditional herbal medicine. It's a multi-action herb with multiple pharmacological properties believed to be due to the presence of multi-bioactive phytochemicals. In this study we investigated the immunomodulatory activity of the polysaccharides which is one of the bioactive components of North American Ginseng root. Traditionally, ginseng root has been used as an adaptogen to counteract various forms of stress. Previous studies suggests Ginseng extracts possessed a paradoxical effect on macrophage activation with the aqueous extract exhibiting pro-inflammatory activity (immunostimulatory effect) while the ethanol extract exhibited anti-inflammatory activity (Inhibition of LPS-Stimulatory effect). In this current study, crude polysaccharides were prepared from North American Ginseng root powder using hot water followed by ethanol precipitation. This was further fractionated by G-75 and G-25 Sephadex Size-Exclusion Columns (97x2.5cm and 30x2.5cm) Chromatography. The immunomodulatory activity of the Polysaccharide extracts in RAW 264.7 murine macrophages were compared with that of Aqueous (AQ) and Ethanol (ET) extracts of North American Ginseng root and Cold-FX, a North American ginseng root herbal product containing enriched polysaccharides (which was used as chemical reference substance).
The following observations were made:

1. The Polysaccharide extracts and aqueous extracts exhibited pro-inflammatory (immunostimulatory) activity by up-regulation of NO production with potency similar to that of Cold-FX.

2. Two hours pre-treatment of the Polysaccharide extracts and aqueous extracts did not inhibit lipopolysaccharide (LPS)-stimulated NO production, while the ethanol extract inhibited LPS induced NO production suggesting the polysaccharide extracts lack anti-inflammatory activity, while the ethanol extracts possess anti-inflammatory activity.

3. 24 hours pre-treatment of the Polysaccharide extracts inhibited LPS- stimulated NO production in a concentration-dependent manner causing desensitization of LPS.

Annual Conference of
Ontario Ginseng Innovation & Research Consortium
November 6 – 7, 2009 – The University of Western Ontario
Poster Abstract

Poster Status	Presentation /Discussion Only ☐ Judge ☑	POSTER # 13
Presenter Name: **Position:** **PTG:** **Supervisor** **Affiliation:**	Misagh Alipour Post-doctoral Fellow Pre-Clinical Zach Suntres Department of Chemistry and Biochemistry, Laurentian University and Northern Ontario School of Medicine	
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Title: Antimicrobial effects of ginseng extracts

Co-Author(s): N/A

Abstract:

The development of new antibiotic compounds that could eradicate pathogenic Gram-negative bacteria (i.e. *P. aeruginosa, E. coli*) has not been very successful. The failure of existing antibiotics to control infection makes it crucial to find alternatives to currently available drugs. A better understanding of bacterial tolerance and resistance to antibiotics have led to new interests in natural or synthetic antibacterial compounds which restrict the ability of bacteria to adhere, communicate, and form biofilm complexes. Plants have evolved numerous chemical strategies for deterring pathogen attack, including the production of bactericidal and anti-infective compounds, leading to their use as medicines. Ginseng, a natural product, has been used for centuries for its therapeutic properties. Crude extracts of ginseng (ginsenosides) have been reported to have many biological properties, including antibacterial and antifungal, along with combinational synergy with antibiotics. In this study, the antibacterial activity of ginseng extracts from five Ontario farms against several bacterial strains was investigated. Also, the multiple effects of the ginseng extracts in preventing *P. aeruginosa* attachment and attenuating virulence and cell-to-cell communication is reported.

PROGRAM AGENDA – Day 2

Saturday, November 7		
8:30 – 9.00 am		**Registration**
9:00 – 12.00	**Session VI**	**Preclinical Study (continued)**
	9.00 – 9.20	M. Bakovic: Studies on the hypolipidemic activities of ginseng in the Pcyt2 mouse model for the metabolic syndrome
	9.20 – 9.40	D. Mutch: Nutrigenomics and obesity: novel insights with microarrays
	9.40 – 10.00	D. Ma: Role of omega-3 fatty acids in obesity and CVD: Is there a combinatory effect of omega-3 fatty acids and ginseng?
	10.00 – 10.20	C. Carruthers and K Rogers: Influence of ginseng extract on atherosclerotic initiation and progression: Experimental design
10.20 – 10.40 am		**Coffee Break**
	10.40 – 11.00	S. Chakrabarti: Ginseng can prevent early changes of diabetic nephropathy
	11.00 – 11.20	M. Barnes and L. Coolen: Ginseng, erectile dysfunction and sexual behavior
	11.20 – 11.40	Z. Suntres: Ginseng as pulmonary anti-infective
	11.40 – 12.00	D. Li, W. Yu, S. Pasyk, E. Lui and C. Bear: Ginseng and pulmonary function in cystic fibrosis
12:00 – 1.00 pm		**Lunch and Annual General Meeting** **Poster Awards**
1.00 – 1.20	**Session VII**	**Advanced Processing** J. Zhu: New Powdered Ginseng Dosage Form
1.20 – 2.20	**Session VIII**	**Commercialization**
	1.20 – 1.40	G. Leong, Jamieson Laboratories: NHP regulations and botanical products R &D
	1.40 – 2.00	D. Sharp, Ivey School of Business: After the science: Thoughts on Ontario ginseng commercialization
	2.00 – 2.20	D. Bradley: Perspective from Ontario Ginseng Growers Association
2.20 – 3.00 pm		**Conclusion. Ed Lui** **Moving Forward**: Presentation by new collaborators of OGIRC K. Hill: Ginsenosides as neuroprotectants in harlequin mice

*For speaker affiliations, please see Registrants list in the program

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Ontario Ginseng Innovation & Research Consortium

OGIRC

ANNUAL REPORT

April 2008 – October 2009





Overview – Year I April 2008 – March 2009

The Ontario Ginseng Innovation and Research Consortium (OGIRC) was established in April of 2008 with funding from the Ontario Ministry of Research and Innovation with partnership from academic and government institutions as well as the agriculture and industrial sector to study new technology for North American ginseng agriculture and product development. Committees were formed to oversee the governance of the OGIRC, and an interdisciplinary research approach was fostered by the creation of seven platform technology groups. In our first year, 26 researchers, seven post-doctoral fellows, 6 graduate students 26 undergraduate students/volunteers, four technicians and one visiting scientist participated in OGIRC research programs. Our members produced seven published or accepted peer-reviewed publications and presented at various international conferences.

Rationale for the formation of the Ontario Ginseng Innovation & Research Consortium (OGIRC)

Canada is the world's largest producer of North American ginseng (*Panax quinquefolius*), with Ontario providing the bulk of the crop. Ginseng cultivated in North America (NA) is a heterogeneous mix of genetic material originally collected from wild populations; the mixing of different seed lots has contributed to genetic diversity in the cultivated populations. Despite its history of cultural use (i.e. the wide-spread acceptance of ginseng as a vital component in traditional Chinese medicine) and declared wide range of pharmacological activities associated with specific extracts or ginsenosides, there is little agreement as to the identity of the active chemical constituents of ginseng and evidence supporting traditional health claims is limited. The primary reason for this ambiguity is often ascribed to poor quality control of the test materials used in clinical trials. In addition, the lack of technology to distinguish the highly valued Ontario grown NA ginseng from cheaper ginseng grown elsewhere compounds the quality issues and threatens the Ontario ginseng market.

Strategic goals and objectives

The Ontario Ginseng Innovation & Research Consortium (OGIRC) is composed of researchers from diverse areas including agriculture, life sciences, biochemical engineering, social sciences, economics, marketing, knowledge translation, and commercialization, organized into seven Platform Technology Groups (PTGs): Plant Biotechnology, Phytochemistry; Pre-Clinical; Safety; Advanced Processing; Knowledge Translation; and Commercialization & Intellectual Property (IP). They are based in major Ontario Universities and Colleges, Agriculture & Agri-Food Canada and collaborate with the Ontario Ginseng Growers Association and the Natural Health Product (NHP) industry (Naturex and Jamieson Laboratories Ltd). The Consortium objectives are:

i) to provide a systematic evaluation of the quality of ginseng roots existing in Ontario and to develop criteria for certification of Ontario brand ginseng

ii) to develop a unique (protectable and trackable) ginseng variety with predictable quality, safety, and medicinal properties by taking advantage of recently developed technologies; and to develop scientific methodologies to validate the uniqueness of these Ontario ginseng varieties

iii) to develop new value-added Ontario branded products possessing selected health promotional effects by applying both established and emerging scientific technologies.

Future directions of the OGIRC

The OGIRC has built a strong foundation and achieved the milestones mandated by the ORF-RE "New Technologies for Ginseng Agriculture and Product Development" grant upon which it is based, but we have also been active in our first year pursuing new funding sources, new collaborations, and expanding our research focus. We were a co-applicant on Algoma University's Canadian Foundation for Innovation infrastructure project titled "Innovation and Integrative Technologies for Natural Health Products"; a co-applicant on a Genome Canada Letter of Intent proposing a "Centre for Medicinal Plants" (lead institution: The University of Western Ontario) and we submitted a Letter of Intent to the Network Centres of Excellence proposing the establishment of a "Natural Products for Health Network", that would function as a research hub to evaluate, develop and integrate the use of natural products in the mainstream health care system, with a focus on Canada's aging population.

Highlights of Year 1

1. 2008 Joint OGIRC – CICMR Conference

Our first year was extremely busy with many events and activities. Our greatest achievement was hosting, along with the Canadian Institute of Chinese Medicinal Research (CICMR), our first annual conference (October 16 – 19, 2008). This conference brought together over 100 participants from across Canada and the US, UK and China; featured internationally renowned speakers such as plenary lecturer Professor P.C. Leung from the Institute of Chinese Medicine (Chinese University of Hong Kong); scientific lectures; panel discussions; student poster presentations; and a public forum held at the Central Branch of the London Public Library. This was a truly multi-disciplinary conference, with scientific sessions on "Chinese Medicine Product R&D", "Efficacy & Safety Issues of Herbal Medicinal Products", "Advances in Chinese Medicine and Integrative Medicine", and "Ginseng Scientific Sessions" which included a great breadth of topics including ginseng agriculture and plant biotechnology, phytochemistry, pharmacodynamics, and medicinal effects on animal and human physiology and neurology.

- Student Poster Award Winners:
  - First place: Alison Buckner, Laurentian University "The effects of Linum usitatissimum (flaxseed oil) on grown of malignant versus non-malignant cell lines
  - Second place: San Nguyen, University of Ottawa "Ethnopharmacology study of Traditional Vietnamese medicinal plants: inhibitory effects on lens aldose reductase"
  - Third Place: Denise Adams, University of Alberta "Traditional Chinese Medicine for the Treatment of Chronic Fatigue: A Systematic Review"

- Student Travel Award Winners

  Denise Adams, University of Alberta
  Alison Buckner, Laurentian University
  Nabeel Ghuyar, McMaster University
  Rui Liu, University of Ottawa

2. PTG Workshop

In December 2008, the OGIRC hosted a Workshop for the Pre-Clinical and Advanced Processing Platform Technology Groups. Seventeen researchers and trainees met to introduce each other to their respective research programs, identify areas of collaboration and methods of co-operation, and to discuss how to best execute experiments so that the results will be comparable across labs.

3. Journal Club

The OGIRC kicked off 2009 with our first Journal Club – an opportunity for OGIRC trainees to present their research proposals or findings, and introduce members from other platform groups to research in their area, thereby enhancing the multi-disciplinary experience for OGIRC researchers and trainees. Presentations by:

Chike Azike, GS (Dr. Lui - Pre-Clinical)
Dr. Sijun Zhou, PDF (Dr. Brown at AAFC - Plant Biotechnology)
Kristina McIntyre, GS (Dr. Arnason – Phytochemistry)
Dr. Subhrojit Sen, PDF (Dr. Chakrabarti – Pre-Clinical)

4. *WORLDiscoveries Research Showcase*

In January, 2009, the OGIRC exhibited at this networking event where researchers and graduate students from the UWO Faculties of Engineering, Science and the Schulich School of Medicine & Dentistry presented their latest research finding to industry representatives. We made valuable contacts with trade representatives from the health care sector and other exhibitors.

5. Media Coverage

OGIRC and its members were featured by several media outlets in our first year:

- London Free Press Biz Monday cover story “Rooting for Ontario ginseng”, August 11, 2008
- The National Post “Root from the home team”, November 17, 2008
- The Walrus “Change of Pace”, December 23, 2008
- The Toronto Star “Students make healthy good enough to eat”, February 12, 2009
- The Guelph Mercury “Playing with food”, February 12, 2009

Platform Technology Group Reports

1. *Plant Biotechnology Platform Technology Group Report*

In Year 1, studies on germplasm evaluation and development were initiated and a recently developed six-step *in vitro* tissue culture system which can produce large numbers of genetically identical plants in about 24 weeks was modified and adapted to heritage seed obtained from the Ontario Ginseng Growers Association. 162 lines were introduced into tissue culture and evaluated for potential donor lines to establish the first synthetic ginseng cultivar in Year 2. The ginseng germplasm collection (approx 600 accessions) at the Delhi site of the Southern Crop Protection and Food Research Centre of AAFC was "dug" and evaluated for visual quality and disease. About 400 of these accessions were selected and re-established in a newly- formed beds for further observation and selection. Samples of three- and four-year-old root was collected from 11 established growers in the Delhi/Simcoe area of the southern Ontario ginseng growing region. Samples were processed using commercial washing and drying protocols and provided to Dr. J. Arnason for ginsneoside analysis and to Naturex for preparation of ethanolic and aqueous extracts. Soil samples were taken from the same grower sites and provided to A&L laboratories for nutritional and pesticide analysis. Samples of 25 roots and seed pods form 5 selected growers were taken, along with soil samples, and cleaned and dried and sent to J. Arnason for individual plant ginsenoside determinations. These samples provide an indication of plant to plant and grower site to grower site variability in the Ontario ginseng commercial crop. Initial results indicate substantial variability in ginsenoside content and profiles exists.
HQP research projects in the Plant Biotechnology PTG include:

- Sijun Zhou – "Micropropagation of ginseng lines"

2. *Phytochemistry Platform Technology Group Report*

The Year 1 objectives of the Phytochemistry Platform Technology Group were to develop product quality standards, characterize and phytochemically differentiate Ontario land races of ginseng and undertake an advanced analysis of polysaccharides. We are progressing on schedule, and have validated two advanced methods for phtyochemical analysis in the University of Ottawa lab. The first is a recent AOAC HPLC-DAD method for ginsenosides developed by Paula Brown at BCIT and the second is an HPLC/MS method for malonyl ginsenosides developed at NRC by Windust et al (2008). These methods are now being applied to characterization of five Ontario land races of ginseng and new lines of ginseng developed by the biotechnology group in collaboration with Dan Brown. University of Ottawa Honours student Cathy Sun has characterized the antiglycation activity of different phtyochemcal extracts and pure ginsenosides from the phytochemistry program. In the Charpentier lab at UWO, the complex polysaccharides are being fractionated and characterized according to molecular weight and degree of branching by gel filtration. These will then be assessed in pharmacology labs in Year 2 and beyond.

The impact of the standardization on the overall project is to provide best evidence of quality of Ontario ginseng with the most up to date methods. The land race study and new lines quality study are providing differentiation of Ontario germplasm from other ginseng types. Both have potential commercial implications. The polysaccharide research is very novel and provides a first look at complex polysaccharides in N American ginseng.

Establishment of the phytochemcial methods has allowed us to assist in a separate OGGA project on trace pesticide removal with supercritical CO_2. The results show that trace pesticides can be removed without removing ginsenosides.

3. *Pre-Clinical Platform Technology Group Report*

The overall objective of the Pre-Clinical Platform Technology Group is to evaluate the medicinal effects of ginseng extracts based on non-human studies with results that could be applied to support non-traditional health claims and the breeding program of ginseng, as well as to assist in the development of advanced processing techniques for value-added ginseng products.

The first year progressed on schedule, as these researchers had to wait for the ginseng roots to be collected and processed to provide the extracts to be used in the pre-clinical experiments. Our recruitment and progress in most cases were consistent with or ahead of the scheduled project Milestones and Deliverables. Year 1 was designed to establish pharmacological testing models *in vitro* and *in vivo* to evaluate the difference between types of extracts as well as preliminary data on the mechanism of action of ginseng. The study on metabolic syndrome (M. Bakovic), diabetes complication related to the retina and kidney (S. Charkrabarti), cardio protection (QP Feng and M Karmazyn), vascular effect (E. Lui), immunomodulation (E. Lui and Q. Madrenas) are on or ahead of schedule. The research groups studying the antioxidant properties on cataract (J. Trevithick), anti-stress & endurance (E. Noble) as well as the anti-infective (Z. Suntres) effect of ginseng have initiated the recruitment for HQP, and are ready to move forward with their research in Year 2. The study on reproductive function, which was scheduled for year two, is on schedule with the recruitment by Dr L. Coolen of an MSc candidate, who will start in May of 2009. The evaluation of the suppression of inflammatory and neurogenic pain by Dr Henry is also scheduled for year 2 and organization of this study is underway.

The research on ginseng conducted in year 1 has provided new technologies appropriate to evaluate the pharmacology of ginseng, understand its mechanism of action and assess product quality. They will have a broader impact on the evaluation of the biological action of herbal medicines in general. The integrative and interdisciplinary nature of this research project has provided the opportunity to subject the same test materials for concurrent evaluation for its multi-medicinal effects. These data will be valuable in validating the multi-action aspects of ginseng which have been proposed for some times. Our most significant findings were the confirmation of the multi-action aspect of NA ginseng, and the observation of the different activities of the organic and aqueous ginseng extracts.

HQP research projects in the Pre-Clinical PTG include:

- Branden Deschambault – “Alleviation of the metabolic syndrome phenotype in *Pcyt2* deficient mice with North American ginseng (*Panax quinquefolius)”*
- Ratnesh Singh – “Effects of ginseng on lipase activity and lipoprotein clearance in the Pcyt2 knockout mouse model for metabolic syndrome”
- Subhrojit Sen – “Preventive effects of ginseng on chronic diabetic complications”
- Tomasz Dzialszynski – “Modeling experimental cataract risk reduction by ginseng extracts”
- Yan Wu – “Cardioprotective effects of ginseng in mice following myocardial infarction”
- Juan Guo – “Antihypertrophic effect of ginseng”

- Chike Azike – "Separation and Characterization of the Immunomodulatory Polysaccharides of North American Ginseng root (*Panax quinquefolius*)"
- Jirui Hou – "Study on anti-oxidative stress activities in vascular injury of ginseng"

4. Safety Platform Technology Group

The objectives of the Safety Platform Technology Group are (1) to evaluate the level of contaminations (pesticides, heavy metals, bacteria) of Ontario grown NA ginseng; (2) to study the reproductive toxicity of ginseng extracts with emphasis on those elite breeding lines derived from the breeding program; and (3) to study the potential for drug-ginseng interaction. Work on the first object began in Year 1, and is progressing on schedule. The reproductive toxicity studies are anticipated to begin in Year 2, and work on objectives 2 and 3 are scheduled to start in the latter part of the project. A significant finding was that the concentration of pesticides, especially DDT was detectable and the levels varied among different farms. Processing, such as lyophilization reduced the levels of DDT; and the alcoholic extracts contained higher levels, whereas the aqueous extracts contained no detectable contamination. Bacterial contamination was minimal. In Year 2, this research will be extended to include soil analysis. This will allow the examination of the correlation between ginseng farm soil and ginseng root contamination. This information will be useful for improving the Good Agricultural Practices guideline for ginseng.

The determination of the extent of pesticide contamination is an important step in assessing the issue of safety to the consumers and the market value of ginseng roots and ginseng products. In addition, it allows one to ascertain whether the pharmacological activities observed in the preclinical studies could be attributed to the presence of contaminants. The analysis of the contaminants of ginseng has called for a close working relationship with the industrial and agricultural sector. This has allowed the establishment of a medium for exchange between academia and the industrial/agricultural sector.

5. *Advanced Processing Platform Technology Group* – A report from the Advanced Processing Platform Technology group is not available.

HQP research projects in the Advanced Processing PTG include:

- Robert Bi – "The research of processing, formulation and delivery system of Ontario Ginseng"
- Raizye Samimihaghgozar – "Extraction Of Ginsenosides from Ginseng"

6. *Knowledge Translation Platform Technology Group* – A report from the Advanced Processing Platform Technology group is not available.
7. *Commercialization Platform Technology Group* – A report from the Advanced Processing Platform Technology group is not available.

OGIRC Governance

Management Committee

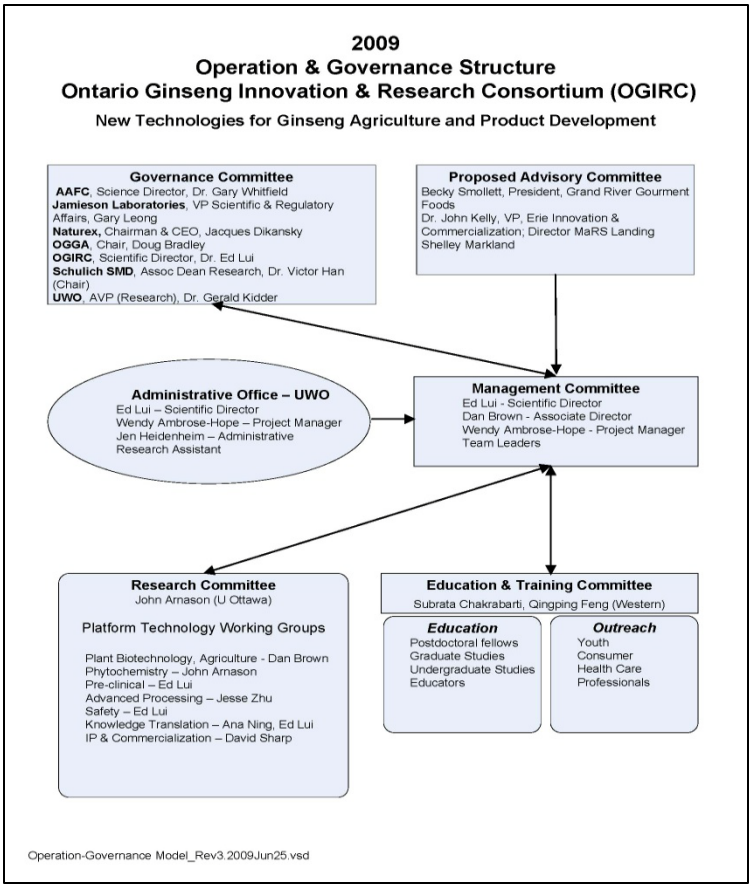
The Management Committee is comprised of the Project Manager, Scientific Director, Associate Director and the Platform Technology Group leaders. The Management Committee's mandate is to oversee the scientific progress of the OGIRC and ensure all Milestones and Deliverables committed to in the ORF Grant Agreement are met.

The Management Committee met in April 2009 to discuss items such as the criteria for reallocating ORF funds; approaching UWO to establish a "Centre for Natural Products and Integrative Medicine" with OGIRC as a component; mechanisms for extending OGIRC membership to new collaborators; and mechanisms for collecting information from the members for inclusion in the ORF Annual Progress Report

Governance Committee

The OGIRC Governance Committee's objective is "To provide forward-thinking leadership and guidance, feedback and strategic planning to ensure the performance and fiduciary responsibilities of the Project are met"; and is responsible for providing vision and recommendations for future administrative and managerial actions, providing fiduciary oversight and reviewing and endorsing the Annual ORF Progress report prior to its submission. The committee membership is based on organizational position, and is comprised of representatives from AAFC (Science Director), Jamieson Laboratories (VP Scientific & Regulatory Affairs), Naturex (Chairman/CEO or Scientific Manager), the Ontario Ginseng Growers Association (Chairperson), Schulich School of Medicine & Dentistry (Dean or Associate Dean of Research), and the University of Western Ontario (Vice President – Research & International Relations, or Associate Vice President – Research).

In Year 1, the Governance Committee met in May 2009, prior to the submission of the ORF report to the Ontario Ministry of Research & Innovation. At this meeting, the Management Committee Terms of Reference were reviewed and accepted; the motion to pass the ORF Annual Progress Report to the Ontario Ministry of Research & Innovation was passed unanimously, and a decision was made to strike a new committee to develop communication guidelines such as recommendations for publications and media releases and resolving any IP issues. The Governance Committee expressed enthusiasm for the application to UWO for a "Centre for Natural Products and Integrative Medicine", suggesting we pursue this goal in the later years of the project.



Sponsorship

The Ontario Ginseng Innovation & Research Consortium (OGIRC) acknowledges the following sponsors and partners:

Government Sponsors

- The Ontario Ministry of Research & Innovation
- Agriculture and Agri-Food Canada

Private Sector Sponsors

- Naturex Inc.
- Jamieson Laboratories Inc.
- A&L Laboratories Inc.
- Ontario Ginseng Growers Association

Institutional Partners

- The University of Western Ontario
  - Schulich School of Medicine & Dentistry
- The University of Guelph
- McMaster University
- University of Ottawa
- Northern Ontario School of Medicine

List of OGIRC Researchers and Trainees

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Praveen Saxena (U Guelph)

Advanced Processing PTG
Jesse Zhu (UWO)
Paul Charpentier (UWO)
John Arnason (U Ottawa)

Knowledge Translation PTG
Ana Ning (King's College)
Ed Lui (UWO)
David Sharp (UWO)
Joel Gagnier (U of T)
Paul Saunders (OCNM)
Mary Wu (TSTCM)
Ling Ting (WORLDiscoveries)

Phytochemistry PTG
John Arnason
Paul Charpentier

Safety PTG
Ed Lui (UWO)
David Bailey (UWO)
Valter Feyles (UWO)

Commercialization & IP PTG
David Sharp (UWO)

Pre-Clinical PTG
Ed Lui (UWO)
Marica Bakovic (U Guelph)
Jim Henry (McMaster)
Zach Suntres (NOSM)
Qingping Feng (UWO)
Morris Karmazyn (UWO)
Earl Noble (UWO)
Subrata Chakrabarti (UWO)
John Trevithick (UWO)
Lique Coolen (UWO)
Joachim Madrenas (UWO)
Kem Rogers (UWO)

OGIRC HQP (April 2008 – March 2009)

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Sijun Zhou (PDF)
Carla Schmidt (T)

Advanced Processing (PTG)
Robert Bi
Raizye Samimihaghgozar

Phytochemistry PTG
Kristina McIntyre (GS)
Chike Azike (GS)*

Pre-Clinical PTG
Subhrojit Sen (PDF)
Yan Wu (GS)
Juan Guo (PDF)
Jirui Hou (PDF)
Chike Azike (GS)*
Hua Pei (T)
Luan Chau (T)
Tomasz Dzialosynski
Branden Deschambault
Ratnesh Singh
Morgan Fullerton

PDF = Postdoctoral Fellow; GS = Graduate Student; T = Technician
*co-supervised by members of different PTGs

Update on Year 2 Progress (April 2009 – October 2009)

1. New funding applications and networking activities

The OGIRC sought out new collaborators and funding sources through the following networking activities:

- ORF – Global Leadership Round in Genomics & Life Sciences Competition "Systems Biology Initiative for the Health Effects and Agriculture of American Ginseng"
  PI: EMK Lui

International Partners	National Partners
• William Jia (Shanghai Innovation Research Centre for TCM) • S.L. Chen (Institute of Medicinal Plant Development) • Gane Wong (Beijing Genome Institute) • PC Leung (Chinese University of Hong Kong – Institute of Chinese Medicine) • Ming Zhu (Beijing University of Chinese Medicine) • Ricky Wong (Hong Kong Baptist University) • Wei Jia (University of North Carolina (Greensboro–Center for Research Excellence in Bioactive Food Components) • C.S. Yuan (University of Chicago – Tang Center of Herbal Medicine Research) • Gregory Chass (Bangor University – School of Chemistry) • Z. Howard (National Institute of Health – National Cancer Institute)	• Jeffrey Zidichouski (National Research Council – Life Science Division) • Dan Brown (Agriculture and Agri-Food Canada) • Marica Bakovic (University of Guelph) • David Mutch (University of Guelph) • David Ma (University of Guelph) • Vladimir Vuksan (University of Toronto) • Imre Csizmadia (University of Toronto) • Zach Suntres (Northern Ontario School of Medicine) • Christine Bear (The Hospital for Sick Children)

- Canada-China International Science & Technology Cooperation (ISTP) Collaborative R&D Project "Technology for production of red American ginseng with enhanced health benefit effects"

Team Canada Lead: EMK Lui	Team China Lead: Guixing Ren (Crop Quality Group, Institute of Crop Science, CAAS)
• Lique Coolen (UWO) • Quim Madrenas (UWO) • Subrata Chakrabarti (UWO) • Qingping Feng (UWO) • Jesse Zhu (UWO) • Paul Charpentier (UWO) • Simon Chiu (UWO) • Denton Hoffman (OGGA)	• Li Lv (The General Hospital of the Chinese People's Armed Police Forces) • Jianguo Fu (Heilongjiang Dondu Ginseng Company Ltd.) • Jia Feng (Ginseng and Antler Association, Jilin Province) • Gang Zhou (Chengdu University) • Yang Yao (Functional Ingredient Lab, Institute of Crop Science, CAAS)

- Canada-China International Science & Technology Cooperation (ISTP) Partnership Development Activities " Sino-Canada Networking for Natural Health Products"

  PI: EMK Lui
  Organizers and contributors:

Team Canada	Team China
• D. Brown (Agriculture and Agri-Food Canada) • Jeffrey Zidichouski (National Research Council – Life Science Division) • John Arnason (University of Ottawa) • Praveen Saxena (University of Guelph) • Subrata Chakrabarti (The University of Western Ontario) • Joseph Tai (Children & Women Health Centre, University of British Columbia) • Gary Leong (Jamieson Laboratories Ltd.) • Winnie Pang (Natural Health Products Directorate) • Denton Hoffman (Ontario Ginseng Growers Association)	• Lead: SL Chen (Institute for Medicinal Plant Development, CAMS) • S. Chao Z. Yang (Shanghai Innovation & Research Centre for Traditional Chinese Medicine) • William Jia (Shanghai Innovation & Research Centre for Traditional Chinese Medicine) • Guixing Ren (Crop Quality Group, Institute of Crop Science, CAAS) • PC Leung (Chinese University of Hong Kong – Institute of Chinese Medicine) • Jianguo Fu (Heilongjiang Dondu Ginseng Company Ltd.) • Li Ping (China-Japan Friendship Hospital) • J. Song (Institute for Medicinal Plant Development, CAMS) • X. Zhanf (Beijing Institute of Genomics, Chinese Academy of Sciences) • C. Liu (The University of Hong Kong)

2. Trainee recruitment

Student recruitment in Year 2 has been active, and the following HQP have joined the OGIRC:

- VS Binhu – Post-doctoral fellow with Dan Brown (Plant Biotechnology)
- Matthew Barnes – Graduate student with Lique Coolen (Pre-Clinical)
- Melissa Moey – Graduate student with Morris Karmazyn (Pre-Clinical)
- Gillian Hewson – Medical student with Quim Madrenas (Pre-Clinical)
- Colin Carruthers – Graduate student with Kem Rogers (Pre-Clinical)
- Jessica Davies – Technician with Kem Rogers (Pre-Clinical)
- Misagh Alipour – Graduate student with Zach Suntres (Pre-Clinical)
- Mehrbod Estaki – Graduate student with Earl Noble (Pre-Clinical)

3. Presentations at scientific conferences

OGIRC members and HQP have attended several national and international conferences to present their ginseng research:

- Jirui Hou – presented at the 2nd Annual Cancer Drug Discovery Symposium, Sudbury ON, August 2009. Winner of a travel award.
- Subhrojit Sen – presented at the 8th Meeting of the Consortium on Globalization for Chinese Medicine, Nottingham UK, August 2009. Winner of a travel award.
- Ed Lui presented at the 4th International conference of TCM on diabetes. Beijing, August 2009.
- Ed Lui presented at the International Conference & Exhibition of the modernization of Chinese Medicine and Health Products. August 2009.
- Marica Bakovic – co-authored three presentations at the Canadian Lipoprotein Conference, Windsor ON, September 2009
- Ed Lui and Subrata Chakrabarti will be presenting at the Recent Development in Chinese Herbal Medicine conference in Singapore, January 2010.

Ontario Ginseng Innovation & Research Consortium
Financial Report

Ontario Research Fund - Research Excellence Grant
New Technologies for Ginseng Agriculture and Product Development
Ontario Ginseng Innovation & Research Consortium

Cash/In Kind Expenses Reported Year One
April 1, 2008 to March 31, 2009

			Industry		
	ORF	**Institution**	**Cash**	**In Kind**	**Total**
PI Salaries & Benefits		397,995.15			397,995.15
Salaries & Benefits (HQP)	178,290.83	172,273.03			350,563.86
Facilities		26,920.50			26,920.50
Equipment	0.00	0.00			0.00
Research Expenses	19,919.46	153,532.25			173,451.71
Conference			15,000.00		15,000.00
Travel / Visitors	12,844.13				12,844.13
Mgmt & Admin - S&B	73,266.04				73,266.04
Mgmt & Admin - Other	24,833.97				24,833.97
Youth Outreach	0.00	0.00			0.00
Audit	0.00	0.00			0.00
Total Cash Expenses	309,154.43	750,720.93	15,000.00	0.00	1,074,875.36
Total Overhead (Cash/In Kind)	123,661.77	306,288.37	*		429,950.14
Total Cash/In Kind Expenses	432,816.20	1,057,009.30	15,000.00		1,504,825.50

* Institution makes in kind contribution by not assessing overhead on Industry $'s

Note: Audited financial statement for Year 1 not available for annual report. Audit underway.

Ontario Ginseng Innovation & Research Consortium
Financial Report

Ontario Research Fund - Research Excellence Grant
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Ontario Ginseng Innovation & Research Consortium
2nd Annual Conference 2009

OGIRC 2nd Annual Conference 2009 Feedback Survey

Thank you for taking the time to participate in this conference evaluation. You comments will enable us to better plan and execute future conferences and tailor them to meet your needs.

Please indicate your position:

O Investigator O Trainee O Undergraduate Student O Associate/Partner Member O Other

Please rank the sessions in order of preference (1 = most enjoyable/useful; 7 = least enjoyable/useful)

___ Session I- Plant Biotechnology, Agriculture, & Phytochemistry
___ Session II & VI - Preclinical Study
___ Session III- Trainee-led Session
___ Session IV- Plenary lecture and discussion forum on metabolomics
___ Session V- Poster Presentations
___ Session VII- Advanced Processing
___ Session VIII- Commercialization

Please indicate your overall satisfaction with this conference (check off one circle):

	Very Satisfied	Somewhat Satisfied	Neutral	Somewhat Dissatisfied	Very Dissatisfied
Registration/communication	O	O	O	O	O
Refreshments, facility and Location	O	O	O	O	O
Date and Time	O	O	O	O	O
Conference Content	O	O	O	O	O
Speaker Schedule	O	O	O	O	O
Social Aspect	O	O	O	O	O

Comments:

What was your overall opinion of the opportunity to engage and involve trainees at the conference?

5 -Outstanding 4-More than Satisfactory 3- Satisfactory 2- Less than Satisfactory 1- Poor

What was the most beneficial aspect of the conference?

If you have any further comments or suggestions, please feel free to write on the back of this page.