Centre for Biomedical Research

Biomedical Engineering Entrepreneurship Partnership Day

Friday, November 2, 2018

University of Victoria | Research Partnerships & Knowledge Mobilization

NSERC CRSNG

TOMORROW'S
HEALTH
TODAY'S
RESEARCH

#uvicbiomed @uviccbr @uvicresearch

Welcome to UVic's Biomedical Technology Industry Partnership Day

Welcome to our Biomedical Engineering – Entrepreneurship Partnership day here at the University of Victoria hosted by the Centre for Biomedical Research! This event represents our second annual showcase of the exciting work being done in biomedical engineering and its associated research programs and entrepreneurship endeavours across the province. As both the Director of the Centre for Biomedical Research and of our undergraduate Biomedical Engineering program, it is a delight to once again welcome interested parties to our lovely university to learn about our work and potential opportunities for collaboration. We are honored to have our distinguished keynote speakers – Sue Paish, the C.E.O. of the Digital Supercluster, and Alan Winter, the Innovation Commissioner for British Columbia, who can provide a vision of what to expect as British Columbia evolves into a major player in these sectors. We also have exciting panels discussing how we can optimize collaborations between academia and the healthcare system and such biotechnology companies to improve the lives of all Canadians. We will end the day with posters demonstrating how our students have made vital impacts in the field of biomedical research.

Thank you for attending and we hope you have a productive day!

Dr. Stephanie Willerth

Canada Research Chair in Biomedical Engineering
Acting Director of the Centre for Biomedical Research
Member of the International Collaboration on Repair Discoveries (ICORD)
Department of Mechanical Engineering
Division of Medical Sciences
University of Victoria

Schedule

9:30—10:30	**Optional Lab Tours**
10:30—11:00	**Registration** with continental breakfast
11:00—12:30	**Welcome** Stephanie Willerth, Director Centre for Biomedical Research Lisa Kalynchuk , Associate Vice-President of Research, UVic **Keynote Speakers**: ♦ Sue Paish, Canada's Digital Technology Supercluster ♦ Alan Winter, BC Innovation Commissioner.
12:30—1:30	**Lunch** with networking opportunities and short presentations from UVic groups
1:30—2:30	**Translating Innovation from Academia to the Clinic Panel** **Moderator:** Lisa Kalynchuk, Associate Vice-President of Research, UVic ♦ Josh Giles, Professor, Mechanical Engineering, UVic ♦ Martin Poulin, Director, Biomedical Engineering, Island Health ♦ David Naysmith, Plastic Surgery, Island Health
2:30—2:45	**Coffee break**
2:45—3:45	**Biomedical Entrepreneurship – A World of Opportunities Panel** **Moderator:** Alexandra (Sandy) Reid, NSERC ♦ Jennie Christensen, CEO and Founder, TrichAnalytics Inc ♦ Paige Whitehead, Founder, Nyoka Designs ♦ Noor Shaikh, Venture Manager, Creative Destruction Labs
3:45—5:00	**Wine and Cheese** featuring posters

Club and Vendor tables available throughout the day

Keynote Speakers

Sue Paish Q.C

CEO at Canada's Digital Technology Supercluster

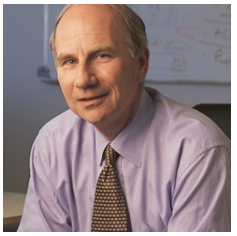
Sue has led transformation and innovation across professional services, healthcare and technology - driving business growth, and leading large-scale organizational change. Sue is the inaugural CEO of Canada's Digital Technology Supercluster – one of the most innovative and meaningful initiatives for the Canadian economy in a generation.

Sue was one of Canada's foremost employment and labour law lawyers, and the youngest managing partner at her firm where she oversaw the firm's growth across three continents, leading it through one of the most significant mergers in the country. She seamlessly transitioned to corporate leadership, first as the CEO of Pharmasave, Canada's largest chain of independent retail pharmacies and then as CEO of LifeLabs Diagnostic Laboratories, where she doubled the company's size to create Canada's largest diagnostic lab, while driving innovations in technology, genetics and stakeholder relations.

In her role as CEO of Canada's Digital Technology Supercluster (CDTS), Sue will oversee innovative cross-sector projects and initiatives that will digitally transform Canada's leading industries, create jobs and grow our economy. Together with the 350+ member organizations, CDTS will lead multi-dimensional collaborations producing innovative digital solutions to industry issues and capture new economy opportunities, making Canada a global leader in digital technology.

Sue and her husband Brad are the proud parents of three daughters- all of whom love exploring Canada's wilderness. Sue has been recognized for community and business leadership with award including: Honorary Doctorate of Technology (BCIT), UBC Faculty of Law Distinguished Alumni Award, YWCA Woman of Distinction, Queen's Counsel, Hall of Fame for Canada's Top 100 Most Powerful Women, and an Influential Women in Business Lifetime Achievement Award. When not driving transformation in business Sue can be found on remote trails across BC, hiking, camping, fishing and enjoying all that BC's outdoors has to offer.

Keynote Speakers



Alan Winter

BC Innovation Commissioner

Dr. Alan Winter is British Columbia's first Innovation Commissioner. Dr. Winter has wide experience at senior levels in the technology sector and in government, including such roles as the President and CEO of Genome BC, the founding President and CEO of the New Media Innovation Centre in Vancouver, the President of the ComDev Space Group in Ontario, and the President and CEO of MPR Teltech Ltd. in Vancouver. He has also served as a director of over 30 organizations.

Dr. Winter is a Fellow of the Canadian Academy of Engineering (FCAE) and a Fellow of the American Association for the Advancement of Science (FAAAS). Dr. Winter received his PhD from Queen's University, Kingston and was recognized by the Queen's alumni Legacy of Achievement.

Translating Innovation from Academia to the Clinic Panel

Lisa Kalynchuk (Moderator)

Dr. Lisa Kalynchuk is the Associate Vice-President of Research at the University of Victoria.

Dr. Kalynchuk holds a BSc. in Psychology from the University of Alberta, and an MA. and PhD in Behavioural Neuroscience from the University of British Columbia. Dr. Kalynchuk joined the University of Victoria on July 1, 2017, and holds an academic appointment with the Division of Medical Sciences, with an adjunct appointment to the Department of Psychology.

Dr. Kalynchuk's research focuses on the neurobiology of depression, the psychiatric complications of epilepsy, and the effect of chronic stress on the brain and behavior. Before joining UVic, Dr. Kalynchuk was a tenured Full Professor in the Department of Medicine at the University of Saskatchewan, and the Interim Associate Dean, Interdisciplinary Health Research in the Office of the Vice-Provost Health. She recently completed two terms as a Canada Research Chair in Behavioral Neuroscience. Her international collaborations include research groups in the United States and the European Union.

Josh Giles

Dr. Joshua Giles is an Assistant Professor of Mechanical Engineering at UVic and leads the recently established Orthopaedic Technologies and Biomechanics Lab. This lab has two main focuses: 1) improving our understanding of fundamental musculoskeletal biomechanics as well as the biomechanics of injuries and clinical treatments, 2) developing novel technologies that can improve orthopaedic diagnosis, clinician training, surgical planning, and rehabilitation. These two areas can involve projects that are independent of each other but Dr. Giles' lab also focuses on the integration of these areas to yield improved clinical impact.

Throughout his career, Dr. Giles' work has been strongly translational whether it has been through biomechanical investigations (primarily during his PhD at Western University, ON) that have answered timely clinical questions and thus changed clinical practice or the development of novel devices to improve surgery as in his post-doctoral research at Imperial College London, UK.

Translating Innovation from Academia to the Clinic Panel

Martin Poulin

Martin Poulin is the Director of Biomedical Engineering at Island Health and the Past President of the Canadian Medical & Biological Engineering Society. The Biomedical Engineering department manages the care and support of medical technology at Island Health's acute care locations. Prior to his role at Island Health, he worked as a Quality and Manufacturing engineer for 5 years in the medical technology development sector. Martin has a Master's in Clinical Engineering from the University of BC and is a registered Professional Engineer with the Engineers and Geoscientists of BC.

David Naysmith

Dr. David Naysmith is a native of Victoria B.C. He has a BSc. (UVic 1971, a degree in dentistry DMD (UBC 1974) a degree in medicine MD (UBC 1977) and a Fellowship in Plastic Surgery (UBC 1983). He has practiced in Victoria for thirty-five years. He is an Assistant Clinical Professor of Surgery in the Division of Plastic Surgery (UBC) and a lecturer and examiner at the Island Medical Program in Victoria. He is a visiting lecturer in the Department of Anthropology at UVic. He has served on the Council of the Canadian Medical Protective Association since 2003. He is a Board Member of Saegis, a subsidiary of the CMPA that focuses on physician education and enhancing safe medical practice.

In 2012 he was given the Service to Medicine and Society Award by the Victoria Medical Society. The Division of Medical Sciences at the University of Victoria granted him the Distinguished Alumni Award in 2014. In 2018 he was honoured to give the Listerian Oration to the Victoria Medical Society. He is the founder and President of: At Risk Rescue Ltd (2006), and S7 Medical Mentor (2015) a medical education program aimed at undergraduate and postgraduate students of medicine.

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Biomedical Entrepreneurship – A World of Opportunities Panel

Alexandra Reid (Moderator)
The Natural Sciences and Engineering Research Council of Canada (NSERC), invests over $1 billion each year in natural sciences and engineering research in Canada. Our investments deliver discoveries—valuable world-firsts in knowledge claimed by a brain trust of over 11,000 professors. Our investments enable partnerships and collaborations that connect industry with discoveries and the people behind them. Researcher-industry partnerships established by NSERC help inform R&D, solve scale-up challenges and reduce the risks of developing high-potential technology.

Dr. Alexandra (Sandy) Reid is a Research & Innovation Development Officer at the NSERC-Pacific office. Sandy is responsible for the Engage, Engage Plus and Connect grants in the Pacific region, and is familiar with the ins and outs of all NSERC grants.

Jennie Christensen
TrichAnalytics Inc. is a one-of-a-kind commercial and research laboratory in Victoria, BC specializing in toxic metal analysis of biological tissues. Our vision is to lead a global movement of non-invasive and non-lethal analysis for the improvement of environmental and human health monitoring. We take microscopic-sized tissues, like a single hair, and analyze them using advanced micro-laser technology to characterize metal exposure in wildlife near industrial developments, and humans working in at-risk occupational settings.

Dr. Jennie Christensen, CEO and Founder of TrichAnalytics, has an MSc and PhD in Toxicology and has worked 20 years in toxicological research and consulting for industries, such as mining and oil and gas. Her passion lies in thinking outside the box to develop innovative and non-invasive ways to monitor health, and has been the recipient of a number of awards for her novel techniques and business. The pinnacle of her career was when she was able to analyze hair and nails from two deceased crew members of the 1845 Franklin Expedition to help solve the lead poisoning mystery.

Biomedical Entrepreneurship – A World of Opportunities Panel

Paige Whitehead

Paige Whitehead is the founder and CEO of Nyoka and creator of the Nyoka Light Wand, the worlds first eco-friendly glow stick powered with bioluminescence. Whitehead was drawn to the potentials of applied biotech to create new materials that are restorative for our rapidly destabilizing planet. Drawing on permaculture and biomimicry ethics, every Light Wand is designed as a vector for an ecosystem-specific blend of pre and probiotics. Over 500 million plastic glow sticks are thrown out annually - these could be transformed into 500 million "seed-bombs" used to restore the mycelial web, improve soil structure, and improve nutrient and water retention, all leading to more productive and resilient ecosystems.

Nyoka is furthering research into biodegradables, ecosystem restoration, long-term carbon sequestration and how to feel really good partying. #scientistswhoparty. Whitehead is currently finishing undergrad at UVic and is gearing up for a crowdfunding campaign to get this innovative startup fully launched.

Noor Shaikh

Noor Shaikh is a Venture Manager at the Creative Destruction Lab-West. She works with their Health Stream which supports ventures in biotechnology, bioinformatics, therapeutics, devices & diagnostics, digital care & education, and other areas. Noor is also currently pursuing her PhD in Biomedical Engineering at the University of British Columbia and is a trainee in their Engineers in Scrubs program. Her prior experience includes upright MRI spine muscle research, pharmaceutical regulatory affairs, and vascular surgery procedure optimization. She completed her undergraduate degree in Engineering Science majoring in Biomedical Systems Engineering at the University of Toronto.

Poster Abstracts

1. Jamie Korner, PhD Student
Department of Chemistry

Title: Microfluidic Droplet Interface Bilayers (DIBs) as a Drug Absorption Model

Abstract: My research focuses on the development of microfluidic platforms to create and use biomimetic droplet interface bilayers, or DIBs, which function as artificial cell membranes. When aqueous-in-oil droplets are formed and brought together, a highly tunable bilayer section forms at the new interface. Microfluidic technology has the potential to revolutionize the study of drug metabolism through its ease of use, accuracy, low costs, use of small reagent volumes, pharmaceutical applicability, and, specifically, the precision with which bilayer parameters (such as lipid composition, bilayer size, droplet content, pH, and electrolyte balance) can be manipulated. The phospholipid compositions of DIBs can be tuned to mimic specific membranes in the body, such as those of the small intestine. At the moment, I am using this "membrane-on-a-chip" to examine the perfusion of fluorescent drugs from dosed droplets into acceptor droplets across the bilayer, designed to mimic small intestine epithelial membranes. Moving forward, I plan to continue to develop this platform to examine drug transport across other membranes in the body and the challenges they pose to drug metabolism research.

2. Jenessa Johnson, MSc Student
Neuroscience Program

Title: Parallel effects of ketamine on fear memory extinction and hippocampal reelin expression after corticosterone administration in rats.

Abstract: Chronic stress plays an important role in the pathogenesis of depression through prolonged elevated glucocorticoid levels which can lead to the dysregulation of glutamatergic signaling. Due to the importance of glutamatergic signaling in memory, patients with depression commonly display alteration in memory processing that biases the recollection of past events towards negative emotional information. Prolonged exposure to the glucocorticoid corticosterone (CORT) induces depression-like behaviour in rats, including making extinguished negatively-valenced associations more prone to reinstatement in a fear conditioning and extinction paradigm. The first aim of the present study was to investigate ….

Poster Abstracts

….**Jenessa Johnson**

the effects of chronic CORT exposure on auditory fear conditioning and extinction, and to evaluate the efficacy of the ketamine in modulating long-term fear and extinction recall in rats. The second was to determine ketamine's impact on reelin expression in the hippocampus. Reelin, an extracellular glycoprotein which induces similar neurobiological changes to ketamine, has been implicated in depression and glutamatergic signaling and was analyzed to determine potential similarities.

Regardless of prior CORT exposure, administration of ketamine induced a substantial attenuation of cue-elicited freezing during conditioned fear recall assessment. CORT administration decreased hippocampal reelin expression, which was rescued by ketamine, though levels of DCX were not rescued. The present study therefore establishes ketamine as a powerful modulator of fear memory, emotionally-driven behavior and a method of rescuing reelin expression.

3. Rob Trska, MSc Interdisciplinary; Wande Abimbola, BSc

EPHE and Dept. of Psycohology; Department of Psychology

Title: "Developing a mobile brain based system for fatigue assessment", authored by Wande Abimbola, Robert Trska, and Olav Krigolson

Abstract: Cost-effective means of measuring fatigue in the realm of professional careers is imperative. Be it in the emergency wing of a hospital or the operations of industrial machinery, the effects of fatigue are evident in both individual health and safety, as well as minimizing cost of potential errors. By utilizing a portable electroencephalography (EEG) device, we may utilize human event-related potentials (ERPs) in a cost-effective and reliable manner to distinguish individuals who are demonstrating physiological effects of fatigue by way of the P300 component.

In the present study, we investigate physiological levels of fatigue in professional clinicians in the emergency wing of the Royal Jubilee hospital. Participants performed a simple odd-ball task on an iPad while EEG data were recorded, in addition to reporting on levels of fatigue, hours rested, hours awake, and hours worked. Current evidence demonstrates a modulation of the P300 component, associating a link between levels of cortical activity and levels of individual fatigue. By utilizing a quick and effective physiological protocol, we demonstrate a potentially unbiased means of assessing individual levels of fatigue that is accessible across various work or environmental conditions.

Poster Abstracts

4. Meghan Robinson, Lab Manager
Willerth Lab, Department of Mechanical Engineering

Title: Transdifferentiating astrocytes into neurons using ASCL1 functionalized with a novel intracellular protein delivery technology

Abstract: Cellular transdifferentiation changes mature cells from one phenotype into another by altering their gene expression patterns. Manipulating expression of transcription factors, proteins that bind to DNA promoter regions, regulates the levels of key developmental genes. Viral deliver of transcription factors can efficiently reprogram somatic cells, but this method possesses undesirable side effects, including mutations leading to oncogenesis. Using protein transduction domains (PTDs) fused to transcription factors to deliver exogenous transcription factors serves as an alternative strategy that avoids the issues associated with DNA integration into the host genome. However, lysosomal degradation and inefficient nuclear localization pose significant barriers when performing PTD-mediated reprogramming.

Here we investigate a novel PTD by placing a secretion signal sequence next to a cleavage inhibition sequence at the end of the target transcription factor - achaete scute homolog 1 (ASCL1), a powerful regulator of neurogenesis, resulting in superior stability and nuclear localization. A fusion protein consisting of the amino acid sequence of ASCL1 transcription factor with this novel PTD added can transdifferentiate cerebral cortex astrocytes into neurons. Additionally, we show that the synergistic action of certain small molecules improves the efficiency of the transdifferentiation process. This study serves as the first step towards developing a clinically relevant *in vivo* transdifferentiation strategy for converting astrocytes into neurons.

Poster Abstracts

5. Karen V. Lithgow, PhD Student
Department of Biochemistry and Microbiology

Title: Interactions of the *Treponema pallidum* adhesin Tp0751 with the human vascular endothelium

Abstract: *Treponema pallidum* ssp. *pallidum* (*Tp*) is the causative agent of syphilis, a sexually transmitted infection characterized by multi-stage disease and diverse clinical manifestations. *Tp* undergoes rapid vascular dissemination to penetrate tissue, placental, and blood-brain barriers and gain access to distant tissue and organ sites. The rapidity and extent of *Tp* dissemination is well documented, but molecular mechanisms have yet to be fully elucidated. Tp0751 is a *Tp* adhesin that interacts with vascular factors and mediates adherence to endothelial cells under shear flow. This study explores the molecular interactions and functional outcomes of Tp0751-mediated vascular endothelium adhesion.

Here we demonstrate that recombinant Tp0751 adheres to human macrovascular and microvascular endothelial cells (ECs), including cerebral brain ECs. This interaction is confirmed using live *Tp,* where spirochete-EC interactions are disrupted with Tp0751-specific antiserum. Further, we identify the 67 kDa laminin receptor (LamR) as an endothelial receptor using affinity chromatography coupled with mass spectrometry to isolate and identify Tp0751-interacting proteins from EC membrane extracts. Notably, LamR is a brain EC receptor for other neurotropic invasive bacterial pathogens. Evaluation of endothelial intercellular junctions reveals that recombinant Tp0751 and live *Tp* disrupt junctional architecture. However, transwell solute flux assays reveal that Tp0751 and *Tp* do not alter endothelial barrier integrity. These findings reveal the mechanics of *Tp* attachment to ECs and suggest that *Tp* may use a specialized mechanism of barrier traversal involving transcytosis or paracellular transit without full opening of intercellular junctions. A more complete understanding of this process will facilitate vaccine development for syphilis.

Poster Abstracts

6. Vanessa Chan, Undergraduate Student
Biomedical Engineering Program

Title: Germline Genetic Variants Identified in Long-Term Survivors of Pancreatic Cancer

Abstract: As the fourth leading cause of cancer death, pancreatic cancer remains a notoriously difficult disease to treat despite major advancements in other cancer types. Tumors often go undetected until the later stages of cancer development proving the disease lethal; the five-year survival rate is only 4% (Am. Cancer Soc. 2007). Unless there are breakthroughs in detection or treatment, pancreatic adenocarcinoma is predicted to become the second deadliest cancer in North America surpassing colorectal and breast cancer. (PanCan2016) Germline genetic mutations have been shown to occur in 5-10% of pancreatic cancer, more so if there is a family history consistent with the associated hereditary cancer syndromes. While standard therapy has displayed only modest effects with substantial toxicity, therapy in the setting of germline genetic BRCA1 and BRCA2 mutations have shown promising results in treatment of malignant pancreatic tumors.

To determine whether patients with germline genetic mutations have improved survival, tumor and normal DNA from a cohort of long-term pancreatic cancer survivors was analyzed for potential mutations in a set of 19 genes that have previously been implicated in pancreatic cancer susceptibility. ATM, a key player in DNA damage response, was potentially mutated in different subjects. Mutations in ATM are also seen in hereditary pancreatic cancer and act in the homologous recombination DNA damage repair pathway.

Poster Abstracts

7. Chloe L. Christensen, PhD Candidate
Department of Biology

Title: Investigating regenerative therapy for inherited neurodegenerative diseas: gene editing in patient-derived induced pluripotent stem cells

Abstract: Lysosomal storage diseases (LSDs) are rare genetic diseases caused by a dysregulation of lysosomal function. Mucopolysaccharidosis IIIB (MPS IIIB) is caused by mutations in NAGLU, which encodes enzyme α-N-acetylglucosaminidase (Naglu). MPS IIIB is characterized by neurodegeneration, resulting in premature lethality. Common treatments for LSDs include recombinant enzyme replacement therapy. However, recombinant Naglu fails to cross the blood-brain barrier. Recent advances in gene editing technologies have allowed for accurate and efficient manipulation of genomic DNA in- and ex vivo. Gene editing of NAGLU mutations in induced pluripotent stem cells (iPSCs) offers a potential solution to the lack of treatment options for MPS IIIB. We have generated iPSCs from MPS IIIB human skin fibroblasts. We performed in vitro RNA-guided engineered nuclease (RGEN)-restriction fragment length polymorphisms (RFLPs) using 15 guide RNAs (gRNAs), followed by detection of gRNA targeting efficiency in iPSCs and fibroblasts. ABEmax base editors were delivered to iPSCs using electroporation. iPSCs were screened using fluorescence microscopy, monoclonal isolation, RFLP, and droplet digital PCR for corrected alleles. In summary, we have targeted NAGLU mutations using gene editing in iPSCs as a proof-of-concept method to restore normal enzyme function in patient-derived cells. This method of gene editing in iPSCs is a putative regenerative therapy for patients afflicted with LSDs.

8. Sukhi Singh, Undergraduate Student
Biomedical Engineering Program

Title: A Novel Biofeedback System for Achilles Injury Rehabilitation

Abstract: The project focuses on a wearable device designed to monitor and report the biomechanical conditions of an ankle. The objective is to improve ankle injury recovery time and outcomes by providing real-time feedback and overuse warnings to rehabilitation patients, as well as provide data logs to their clinicians for later analysis.

Poster Abstracts

9. Brent Godau, MASc Candidate
Department of Mechanical Engineering

Title: Self-filling Microwell Arrays for Tumour Spheroid Formation

Abstract: Tumor spheroid formation in microwell arrays is a promising approach for high-throughput screening of chemotherapeutic agents. This method offers the advantage of better mimicking the complexities of tumors as compared to conventional monolayer culture systems. However, using these technologies to their full potential is hindered by the inability to seed the cells within the wells uniformly and with high yield and reproducibility. Moreover, standard manufacturing approaches for fabrication of microwell arrays rely on lithography and etching techniques, which are costly, labor-intensive, and time-consuming. Herein, we report on the development of self-filling microwell arrays (SFMAs) in which cells are directed from a loading chamber to microwells using inclined guiding channels. The SFMAs are fabricated by replica molding of three-dimensionally (3D) printed molds in agarose. We characterize the fabrication process, demonstrate the ability to culture breast adenocarcinoma MCF-7 and glioma U87 in SFMAs and perform drug toxicity studies. We envision that the proposed innovative approach opens avenues of opportunities for high-throughput three-dimensional cell culture for drug screening and disease modeling.

Poster Abstracts

10. Raquel Romay-Tallon, Post Doctoral Fellow
Division of Medical Science

Title: Peripheral reelin administration rescues neurochemical alterations and depression-like behavior in a preclinical model of depression

Abstract: Chronic stress is a significant risk factor for the development of depression and can be studied preclinically using çorticosterone (CORT)-administration paradigm. We have shown that CORT treatment produces a behavioral phenotype of depression that is associated with neurological deficiencies which parallel changes seen in these parameters in human depression patients. Our most recent data revealed that intrahippocampal infusions of reelin can normalize these behavioral and neurobiological alterations. Here we examined whether peripheral intravenous administration of reelin may have a similar antidepressant-like effect.

Rats received 21 days of daily CORT or vehicle injections along with either 3µg or 5µg of reelin every 5 or 10 days. Thereafter, rats were subjected to the forced swim test (FST) and the open field test (OFT), and then sacrificed to permit immunohistochemical analyses of the number of reelin-immunoreactive (ir) cells in the subgranular zone (SGZ) and paraventricular nucleus (PVN) as well as the number and complexity of newborn neurons in the SGZ. We also analyzed serotonin transporter (SERT) protein clustering in lymphocytes. Our results revealed that peripheral reelin reversed the CORT-induced increases in FST-immobility, the downregulation of reelin in the SGZ, and the increase in size of SERT clusters.

These novel findings show for the first time that peripheral reelin administration can normalize CORT-induced increases in depression-like behavior alongside with neurobiological deficits. Although additional mechanistic and pharmacokinetic studies are necessary, our data also open the possibility of developing reelin peptides with antidepressant activity.

Poster Abstracts

11. Michael Peirone, Chief Operating Officer
Victoria Hand Project

Title: Victoria Hand Project

Abstract: The Victoria Hand Project (VHP) is a Canadian non-profit organization, providing amputees in the developing world with prosthetic care. For people missing an upper-limb, the lack of a prosthesis is a major disability that negatively affects their quality of life. The World Health Organization estimates 80% of people in need of prosthetic care live in developing countries, but only 5% have access to proper care. VHP's mission is the provision of upper-limb prosthesis to amputees in developing countries, with limited or no access to prosthetic care. VHP has created the Victoria Hand System: a series of body-powered prostheses that allow amputees to do home and work-related tasks, and to improve their quality of life. VHP's approach has three key features: (1) setup of a production/fabrication center and training to make these 3D printed prostheses on-site within developing countries; (2) training and working with clinical intermediaries and medical practitioners to provide professional care for amputees; (3) on-going operations support for both the production center and the clinical provision network. VHP currently has print centers in Guatemala, Haiti, Ecuador, Nepal, Cambodia, and Egypt. VHP plans to expand to Uganda in the near future after receiving funding from Google.org.

Poster Abstracts

12. Laura de la Vega, PhD Candidate
Department of Mechanical Engineering

Title: 3D bioprinting neural tissue

Abstract: Spinal cord injury (SCI) is a devastating condition mainly caused by vehicular accidents, falls, and acts of violence. There are 86,000 people living in Canada with a SCI. Although most of these injuries result in incomplete tetraplegia or paraplegia, no cure exists for this disorder. Development of treatments for SCI remains challenging as regeneration of the central nervous system (CNS) is limited. Current pre-clinical drug testing strategies have several limitations as they do not accurately mimic *in vivo* human responses to drug targets. Tissue engineering (TE) can overcome these limitations by creating tissues that resemble human physiology. 3D Bioprinting is the process of fabricating 3D biological tissues and organs using a combination of biomaterials and 3D printing technology. This technique offers several advantages to conventional TE such as creation of tissues with specific cell pattering and micro-architectures, is high throughput and reproducible. This research developed bioprinted neural tissues derived from human induced pluripotent stem cells (hiPSCs) as a tool for pre-clinical drug screening. Here, we bioprinted hiPSC-derived neural progenitors using the microfluidic Lab-on-a-printer™ technology from Aspect Biosystems in combination with our novel bioink. These customized 3D tissues were cylinder-shaped-1cm diameter constructs with seven layers each 150-200μm in thickness. Analysis post-printing showed high levels of cell viability and differentiation into motor neurons such as those found in the spinal cord.

Poster Abstracts

13. Chris Lee, Undergraduate Student
Biomedical Engineering Program

Title: Bioprinting a novel glioblastoma tumor model using a fibrin based bioink

Abstract: Glioblastoma multiforme is a deadly primary brain cancer that exhibits invasive proliferation into healthy brain tissue. Currently, novel treatment methods, such as molecular targeted therapy, immunotherapy, gene therapy, stem cell–based therapies and nanotechnology, are being investigated as possible alternatives to the current standard of care for the disease. However, investigation into novel GBM treatments remains hindered by the limited ability of pre-clinical disease models to accurately assess drug effectiveness. Recent developments in the fields of biotechnology and tissue engineering have made 3D bioprinting of hydrogel-based biomaterial scaffolds a feasible method for rapidly producing an accurate *in vitro* model for glioblastoma, custom designed to the needs of the investigator. Here, we developed a novel fibrin-based 3D printed glioblastoma for cellular characterization and drug screening. This model uses an Aspect Biosystems Lab-On-a-Printer™ microfluidic print head to minimize shear stress and allow for effective printing of delicate neural tissue. Printed glioblastoma cell-laden structures displayed extremely high cell viability up to 12 days following initial printing. Furthermore, printed cells spontaneously formed spheroids and upregulated proteins CD133 and DCX, markers associated with cancer stem cells and metastatic invasiveness, respectively. Printed scaffolds were then treated with a novel chemical treatment method previously only tested in 2D culture and showed significant resistance, indicating the 3D printed glioblastoma model's potential as a more accurate representation of the *in vivo* response to drug treatment.

Poster Abstracts

14. Cristina Pinar, Graduate Student
Division of Medical Sciences

Title: Effects of Repeated Mild Traumatic Brain Injury in the Juvenile Brain

Abstract: Traumatic Brain Injury (TBI) occurs when an impulsive force is transmitted to the head and affects the brain. Up to 75% of all brain injuries are classified as "mild" TBI (mTBI; also known as concussion). There is growing evidence that during a life time repeated mTBI (rmTBI) can produce cumulative structural damage and long-term changes in behaviour. The juvenile brain is in a period of robust synaptic reorganization and myelination, making this a particularly vulnerable time to incur either mTBI or rmTBI. Although most children recover from mTBI incidents, a significant proportion experience learning and memory impairments after rmTBI. Memory formation is closely dependent on the capacity of the brain to regulate long-lasting changes in neuronal communication (synaptic plasticity) with the hippocampus being an essential structure for this process. Therefore, we hypothesize that rmTBI causes learning and memory deficits through its effects on hippocampal synaptic plasticity.

Methods: Using the Awake Closed-Head Injury (ACHI) model we examined how male and female Long-Evans rats (25-28 days of age) responded after 8 episodes of ACHI over a four day period in. Animals were assessed for changes in their state of consciousness and sensorimotor abilities immediately following each ACHI, allowing us to examine the acute effects of each injury. Synaptic plasticity was assessed using in vitro electrophysiology either one day or seven days post-ACHI.

Results: Our results show that rmTBI impacts sensorimotor abilities and impairs hippocampal synaptic plasticity in both males and female subjects.

Poster Abstracts

15. Chen Liu, Postdoctoral Fellow; Wen Cui, PhD Student; Lin Cai, Professor
Department of Electrical & Computer Engineering

Title: Project: Sleep monitoring using wireless signals for health care

Abstract: Sleep plays an important role in an individual's health. Sleep-activities including respiration, snore, cough, sleep talking and sleep postures are closely related to sleep quality, sleep disorder, and even illnesses. Continuous sensing of these activities during sleeping is useful in sleep quality monitoring and early detection of many diseases. Today, monitoring sleep is done in hospital. It requires a person to wear many sensors all over their bodies a whole night, negatively affecting the sleep quality.

To support in-home sleep monitoring without any on-body sensors, a promising enabling technology is wireless sensing, where the person can sleep comfortably at home and the wireless device sits in the background. Recently, a UVic research group leading by Prof. Lin Cai is working on monitoring sleep with wireless sensing technology. By transmitting low-power radio signals only, the sleep activities can be successfully identified through analyzing the reflected signals from a person's body. They also combine the advanced AI algorithm which takes the radio signals as the input and feeds to a neural network to determine sleep activities and even sleep stages. This research can provide new opportunities in applying wireless signals for patient-centric digital care, especially for elderly, baby, and patient care.

Poster Abstracts

16. James McFarlane, PhD Candidate
Department of Chemistry

Title: Selective Ligand-Induced Conformational Ensemble (SLICE) docking: Development and Applications for Therapeutic Peptide Screening

Abstract: The SLICE technique is a molecular simulation tool designed to predict the affinity and final binding geometry of protein-drug interactions. The technique is specifically designed to handle difficult targets such as flexible proteins or peptide-based inhibitors. To do this, SLICE is a combined method that includes both time dependent simulations of the atoms AMBER Molecular Dynamics Suite) as well as intermittent random sampling of the possible spatial interactions (AutoDock Vina). After successfully applying the method to a model system, Chromobox protein homolog 8 (CBX8), we are now applying the SLICE method to combinatorial libraries against multiple drug targets.

17. Proteomics and Metabolomics Technology Development and Service Facility
The University of Victoria—Genome BC Proteomics Centre

Abstract: The UVic-Genome BC Proteomics Centre (PC) is the central hub of Canada's Genomics Technology Platform Pan-Canadian Proteomics Centre (PCPC) for proteomics technology development and service. The PC is also a founding member of The Metabolomics Innovation Centre, Canada's leading metabolomics facility, focused on quantitative metabolomics. The PC has been providing mass spectrometry analytical services to a wide variety of academic, industrial, and government laboratories since 1982, making us the longest operating protein and metabolomics core facility in Canada. Over the last 10 years, the PC has completed >1,000 projects for academic and industrial researchers. The Centre's technology development program supports ongoing research and the development and application of novel methods in the areas of biomarker identification and characterization, quantitative proteomics and metabolomics, as well as bioinformatics. Supported by Genome Canada, Genome BC, and the University of Victoria, the Centre is located at VITP in 5,000 sqft of custom laboratory space and houses over $15 million in state-of-the art mass spectrometry instruments, which are supported by a dedicated team of more than 35 researchers and technicians.

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Thank you to our partners and supporters

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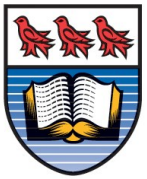

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