Multidisciplinary Undergraduate Research Projects in Health (MURPH)
INTRODUCTION TO MURPH

MURPH is an undergraduate research program at the University of British Columbia - Okanagan campus that aims to offer a unique cross-disciplinary platform to undergraduate students for engaging in academic research, while also providing professional training through custom-designed workshops. The core component of MURPH includes project teams comprising multiple undergraduate students and faculty members across different disciplines working together on applied (often industry driven) health research projects.

MURPH MANAGEMENT TEAM

Dr. Joan Bottorff  
Professor  
School of Nursing

Dr. Abbas Milani  
Professor  
School of Engineering

Dr. Harry Miller  
Professor  
Psychology, Southern Medical Program

Dr. Neil Eves  
Associate Professor  
School of Health and Exercise Science

Dr. Natalie Forssman  
Lecturer  
School of Engineering

Dr. Mahdi Takafolli  
Research Engineer and MURPH Founder  
Materials and Manufacturing Research Institute

“...We all have different work habits and can contribute to the team in various ways. Learning how to work together to overcome our differences but still excel in our areas of expertise can lead to a cohesive and well-rounded team.”  

- A MURPH Scholar
Multidisciplinary Undergraduate Research Projects in Health (MURPH): Structure

The MURPH program is a multidisciplinary and interdepartmental research hub at University of British Columbia Okanagan (UBCO), fostering collaborations at the edge of basic and applied research between local, national, & international research & development sectors.

Mission

To engage undergraduate students in multidisciplinary research and offer learning objectives mainly relevant to collaborative techniques that are not typical outcomes of current undergraduate research programs at universities.

Core Objectives

MURPH offers a unique multidisciplinary research setting along with scholarly and professional development training to undergraduates at UBCO, targeting various learning objectives including:

1. Developing skills for collaboration, scientific discussion, and brainstorming with undergraduate/graduate peers, faculty members, and collaborators from other disciplines;
2. Developing and refining research plans and protocols collaboratively; and
3. Engaging in health research activities that are meant to have meaningful impact on communities, hospitals, industries, etc.,.

History & Success Stories

The 2019-2020 program supported 9 applied health projects encompassing 10 disciplines with a total of 19 faculty members and 21 MURPH Scholars. Below are examples of projects and achievements by students in the program (MURPH Scholars).

MURPH Fosters Collaboration Across all Faculties
MURPH 2019-2020 Highlights

MURPH Launch Event
(Oct 9, 2019)
Introduction to the program, management members, and funded project teams

Workshop #1
(Nov 13, 2019)
Teamwork & Collaboration

Workshop #2
(Jan 20, 2020)
Patient-Oriented Research & Design Thinking

Workshop #3
(Feb 24, 2020)
Research Dissemination

UBC Okanagan Interdisciplinary Student Health Conference
(Mar 5, 2020)

Recognitions

- MURPH funding was awarded by the Office of the Vice-President, Research and Innovation.
- MURPH was featured as a model program at the UBC Board of Governors meeting on Feb 14, 2020.
- Two of the nine MURPH posters presented at the 2020 UBC Okanagan Interdisciplinary Student Health Conference (Kelowna) were awarded best poster presentation in their respective categories.
- Five students were offered summer employment as a result of the MURPH program.
- One MURPH research group presented their work at the International Conference on Radiology and Physics of Medical Imaging.
I’m T’CARE (Indigenous methodologies): Building Capacity for Telediabetes Care in Urban (and Rural) Indigenous Communities

Purpose

This project is aimed at providing culturally safe and effective diabetes and obesity telehealth for Urban or “off-reserve” Indigenous Peoples. (With regard to this project, telehealth can be thought of as a way of connecting a diabetes/obesity specialist with a patient in a different location via video calling software.) Indigenous Peoples in B.C. represent 6% of the population and over 60% live in urban areas. Access to health and wellness services is limited and often not found on reserve. The Canadian Institutes of Health Research and the Public Health Agency of Canada, declared that the combination of higher rates of diabetes, obesity and related complications is one of the four urgent Indigenous health challenges (Indigenous Pathways for Diabetes and Obesity, 2018). This project’s goal is to bring together traditional and western knowledge to improve diabetes and obesity wellness in urban and rural Indigenous communities.

Research Impact

Connecting urban Indigenous individuals with diabetes/obesity specialists in a cost effective and culturally safe way will improve healthcare outcomes. This project will remove existing barriers to healthcare access by establishing functioning relationships between physicians, Elders, individuals, families, caregivers, and communities.

MURPH Scholars

Aidan O’Callahan
Karim Davarani

Principal Investigators

School of Nursing
Dr. Donna Kurtz

Southern Medical Program
Dr. Charlotte Ann Jones

Research Team Testimonial

“Being a MURPH scholar has allowed us to collaborate across multiple disciplines and also increase our leadership and teamwork skills.”

- Aidan & Karim

What would make a obesity/diabetes TeleHealth program or appointment safe and comfortable for Elders and family members?

- Private room
- Family/friend with you
- Indigenous doctor
- Trusted local health provider
- Traditional healer/Elder
- Private AND group sessions

Adapted from Susi Wilkinson.
Smoke-free Dads:
A Game Changer for Better Health

**Purpose**

The purpose of this project is to develop a smartphone app that will help fathers reduce and quit smoking, while at the same time, support their engagement in fathering, in addition to supporting other positive health behaviours. The focus is on fathers because studies show that their desire to be healthy role models for their children strengthens motivation for smoking cessation. While reliance on smartphones to obtain health-related information is increasing, mobile smoking cessation resources tailored for fathers have not kept pace.

The objective of this project is to explore the use of mobile technologies and gamification to extend the reach of the Dads in Gear smoking cessation program and the engagement of fathers in stopping smoking.

**Research Impact**

The Dads in Gear app will empower fathers to be involved, healthy and smoke-free dads by providing both general and personalized support that can be accessed just by reaching into their pockets. Through the app, fathers will be encouraged to embark on their journey to quit smoking and become the dads they want to be.

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MURPH Scholars

Angela Leung
Noman Mohammad

Principal Investigators

School of Nursing
Dr. Joan Bottorff
Dr. Laura Struik

School of Computer Science
Dr. Mohammad Khalad Hasan

Research Team Testimonial

“The MURPH project provided us with an opportunity to learn how each team member’s strengths contributed to thinking creatively as we worked to design a novel smartphone app to support health behaviour changes.”

- Angela & Noman
Health Promotion using Data from Internet of Things Devices and Platform Applications

**Purpose**

In order to provide an affordable health-care platform that promotes health and wellbeing, our research aims to convert the health information provided by participants into interactive graphs that are simple, yet concise. The data will be retrieved directly from Internet of Things (IoT) devices, such as watches or Fitbits, and added to the participant profile with ease. The goal of our work is to provide participants and their healthcare providers with snapshots into people’s health, such that participants can set health-related goals and visualize their progress. This can also determine the most feasible IoT device for online interactions.

**Research Impact**

Small communities that are experiencing a rapid population growth, such as Lake Country, have increased demands on the limited healthcare resources available. By conducting case studies of community leaders and integrating goal-setting strategies with evidence-based lifestyle recommendations with technology, our platform will allow such communities to work towards positive health outcomes more effectively while reducing the strain on the community’s healthcare system.

“Working in a multidisciplinary team has allowed us to understand and integrate the different approaches we bring from our respective fields into a shared project, providing us a space for us to develop and strengthen our concepts, work habits, communication, and teamwork.”

- Mirna & Emily

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**MURPH Scholars**

Mirna Hennawy  
Emily Medema

**Principal Investigators**

School of Management  
Dr. Barb Marcolin  
School of Engineering  
Dr. Homayoun Najjaran

**Research Team Testimonial**

Marcolin’s research platform will integrate all components of goal-setting above.
**Purpose**

Inflammatory bowel disease (IBD) is a chronic digestive disease which is growing globally. Probiotics are a promising therapy for many ailments including IBD. However, many factors currently limit their effectiveness including low viability of bacteria from the production process, a limited survival past the acidic stomach, and poor colonization in the oxidized gut of patients. The purpose of this research project is to develop a device that can increase the viability of the probiotic. Thus, microencapsulation will be used to determine the health and species of bacteria being examined. We will do this by looking at chemicals that are produced by bacteria. We aim to create a platform that is easy to manufacture, operate, and transport.

**Research Impact**

Our designed chip will have the potential to be used by hospitals, the military, and developing countries. Since the chip can identify bacteria based on their chemical pattern, it can be used for identifying bacterial infections and survival, defend against bioterrorism, and food safety.

**Research Team Testimonial**

“The benefit of working in a multidisciplinary group is the increased amount of ideas and perspectives that can be applied to solving a problem.”

- Ryan & Kaden
Investigation of Different Insect Repellents to Develop an Anti-Mosquito Paint

Purpose

Common pesticides such as Picardin and DEET are used to repel mosquitoes. Although effective, mosquitoes can become immune to them by inheriting resistance. Natural compounds are more complex and have lower risk of mosquitoes building resistance. The purpose of our research is to investigate novel insect repellents derived from plants. We will test these new plant compounds for their ability to repel mosquitoes. These new repellents will be combined with paint and applied to buildings to protect humans from diseases that are spread from mosquitoes.

Research Impact

Currently, 250 million people are affected by mosquito borne diseases with 2.7 million deaths per year. Some mosquitoes can transmit yellow fever, dengue fever, zika virus, etc. Our goal is to decrease the transmittance of diseases via mosquitoes by developing new mosquito repellent paint.

“Our team brings together expertise in mechanical engineering and the biology of mosquitoes to develop a new tool to combat diseases caused by mosquitoes.”

- Helena, Giulia, & Madison
Specific Exosome Isolation and Size Characterization

**Purpose**

We aim to isolate exosomes: a sub-population of nano-sized vesicles, released by all cells of the body, and found in all bodily fluids. This is an attempt to correct the current standard in the field where it is impossible to separate the exosome from other nano- and micro-sized vesicles. We aim to develop a microfluidic device to isolate exosomes. Specifically, a semi-crude biological sample will be refined by physical properties such as mass and rough size before being characterized by the presence of certain fluorescent chemicals and size. We also aim to develop a high-resolution microscopy method to image the individual exosome. This will allow for a more accurate understanding of what an exosome is before its biological functions can be reliably investigated.

**Research Impact**

Exosomes carry biomarkers with tremendous potential for disease diagnosis and monitoring. Being able to isolate the exosome from bodily fluids allows for future research into the development of a liquid biopsy technique to probe for diseased cells, in particular cancer. Additionally, this may lead to the development of drug delivery platforms.

Super-resolution TIRF Microscope used to image isolated Green-Fluorescent Protein labelled exosome sample (R).

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**MURPH Scholars**

Alexander Corbett  
George Ng

**Principal Investigators**

Chemistry  
Dr. Issac Li

School of Engineering  
Dr. Mina Hoorfar

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**Research Team Testimonial**

“Provides cross-faculty introduction to research required for success in today’s increasingly multidisciplinary academic environment.”

- George & Alexander
The Effects of Virtual Reality on Depressive Symptoms and Sedentary Behaviour in Inpatient Stroke Survivors

**Purpose**

The purpose of the current study is to develop an understanding of the effects of a virtual reality (VR) program on depressive symptoms and activity levels among inpatients receiving stroke rehabilitation. Both depressive symptoms and sedentary behaviours are associated with sub-optimal recovery after stroke. There is little research on the effects of VR on psychological and social outcomes post-stroke. The present study will use a multidisciplinary approach to investigate: 1) VR as a plausible treatment to improving depressive symptoms among stroke survivors; and 2) whether improved depressive symptoms have an effect on sedentary behaviour.

**Research Impact**

This study will provide a greater understanding of the clinical usefulness of VR at improving depressive symptoms and sedentary behaviour among stroke inpatients. Such improvements may lead to better engagement in rehabilitation among stroke survivors, and thus more optimal recovery after stroke.

An example of a participant in a virtual reality game.
Optimal Stent Material for Reduction of Adverse Side Effects in Head and Neck Cancer Radiotherapy

**Purpose**

Head and neck cancer patients are often treated with radiotherapy, during which healthy oral cells are damaged leading to post-therapy symptoms such as dry mouth, tooth decay, and loss of taste. These symptoms are often exacerbated by backscatter of the radiation from dental restorations (fillings or implants). The purpose of this project is to reduce adverse side effects in head and neck cancer patients who undergo radiotherapy, specially those with dental restorations. This can be achieved by designing a novel mouthguard that can absorb backscatter while not affecting treatment efficacy.

**Research Impact**

Every year approximately 500,000 new cases of head and neck cancer are diagnosed worldwide. Our research is important because it allows for less complications during radiotherapy and improves patient quality of life.

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Model of stent application with dental restorations.
**X-Ray Vision: Seeing Radiation from Medical Procedures**

**Purpose**

During some surgical procedures an x-ray machine is used to see inside the body. This x-ray machine is on for most of the time. The x-ray can be on for 5 minutes or more, which is much longer than a typical imaging x-ray that is on for less than a second. While the x-ray machine is on, radiation scatters towards staff. We are developing an x-ray camera in order to see this radiation hazard. From this picture of radiation scatter, staff can decide how to work more safely. This work brings together pinhole camera and tomographic reconstruction (TR) concepts to make a TR camera. CT scans use TR. We believe a TR camera can create clearer images than an x-ray pinhole camera.

**Research Impact**

Seeing X-Ray scatter allows staff to change how they work to be as safe as possible.

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**MURPH Scholars**

Andrew Nicholson
Reece Walsh
Joan Brewer

**Principal Investigators**

Physics
Dr. Thorarin Bjarnasson

School of Engineering
Dr. Jonathon Holzman

**Research Team Testimonial**

“Working in a multidisciplinary team has allowed us to collaborate with people and faculties we may individually have not had access to. This work expands our knowledge. This work also improves our project management skills.”

- Andrew, Reece, & Joan

X-Ray machine similar to those used during procedure.
Benefits of Collaborating with MURPH

We have developed a variety of opportunities to meet each industry partner and sponsor’s objectives and needs. Your contribution will greatly strengthen our capacity to deliver high quality programming and allow for the expansion of the MURPH program to train more undergraduate students in our community.

1. **Increase your visibility within the community**

Feature your logo on the MURPH website, as well as its events as a sponsor of the program.

2. **Be a guest speaker**

Become a guest speaker at our upcoming MURPH events and workshops.

3. **Collaborate with UBC laboratories**

Work with a globally respected university and faculty members and gain access to state-of-the-art research facilities.

4. **Receive research support**

Submit your project proposal [here](#) to conduct multidisciplinary research projects by students under your membership for each academic year.

5. **Build world-class talent**

Aid in the training of students and prospective employees by equipping them with job-ready skills.
The MURPH program is continually seeking partnerships with health and medical industry and organizations to enhance the training and educational experience of the undergraduate students at UBC, helping them better transition into productive employees of the Canadian healthcare sector.