



THE UNIVERSITY  
OF BRITISH COLUMBIA



PROGRAM OVERVIEW

# Multidisciplinary Undergraduate Research Projects in Health (MURPH)



Materials & Manufacturing  
Research Institute  
Experience Innovation with Us



Institute for Healthy Living and  
Chronic Disease Prevention  
PARTNERS IN RESEARCH FOR BETTER HEALTH



## 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 Sciences



**Dr. Natalie Forssman**  
Lecturer  
School of Engineering



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

## MURPH GRADUATE MENTORS



**Negin Kazemian**  
PhD Student  
Applied Science



**Natasha Haskey**  
PhD Candidate  
Biology

*"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;
1. Developing and refining research plans and protocols collaboratively; and
2. 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.



**2019-2020 MURPH SCHOLARS**

# 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.

**Telehealth Care Model**

- What would make a obesity/diabetes TeleHealth program or appointment safe and comfortable for Elders and family members?
- How can we bring Traditional Healers, Elders and Knowledge Keepers to this program?

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

Adapted from Susi Wilkinson.



## 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

# 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.



Dads in Gear application.



## 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



### MURPH Scholars

Mirna Hennawy  
Emily Medema

### Principal Investigators

School of Management  
Dr. Barb Marcolin

School of Engineering  
Dr. Homayoun Najjaran

### Research Team Testimonial

“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**

# 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.



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

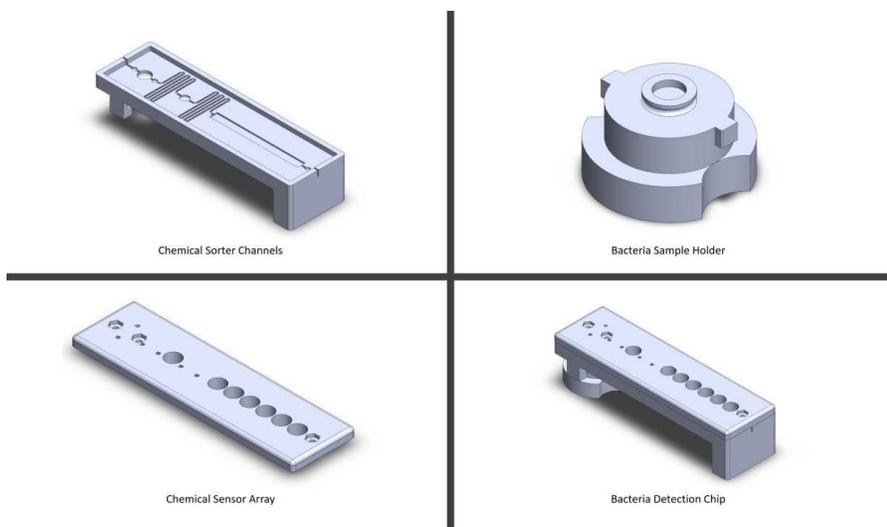
# Bacteria Identification Chip

## Purpose

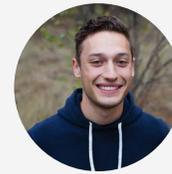
Inflammatory bowel disease (IBD) is a chronic digestive disease which is growing globally. Probiotics are a promising therapy for many ailments including IBD. However, many factors currently limit their effectiveness including low viability of bacteria from the production process, a limited survival 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.



Bacteria detection chip prototype.



## MURPH Scholars

Ryan Bonnie  
KadenWorkun

## Principal Investigators

Biology  
Dr. Deanna Gibson

School of Engineering  
Dr. Mina Hoorfar

## 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



### **MURPH Scholars**

Helena Nunes  
Giulia Ross  
Madison Dirks

### **Principal Investigators**

Biology  
Dr. Mark Rheault

School of Engineering  
Dr. Kevin Golovin

### **Research Team Testimonial**

“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**

# Investigation of Different Insect Repellents to Develop an Anti-Mosquito Paint

## **Purpose**

Common pesticides such as Picardin and DEET are used to repel mosquitos. Although effective, mosquitos can become immune to them by inheriting resistance. Natural compounds are more complex and have lower risk of mosquitos 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 mosquitos can transmit yellow fever, dengue fever, zika virus, etc. Our goal is to decrease the transmittance of diseases via mosquitos by developing new mosquito repellent paint.



We do bad things to bad bugs. Anti-mosquito paint.

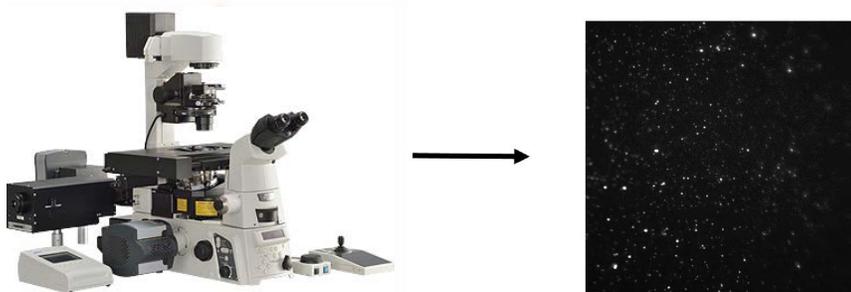
# Specific Exosome Isolation and Size Characterization

## 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).



## MURPH Scholars

Alexander Corbett  
George Ng

## Principal Investigators

Chemistry  
Dr. Issac Li

School of Engineering  
Dr. Mina Hoorfar

## Research Team Testimonial

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

- **George & Alexander**



### **MURPH Scholars**

Nicole Ketter  
Lydia Wood

### **Principal Investigators**

UBC Medicine  
Dr. Brodie Sakakibara

Social Work  
Ms. Donna Janson

### **Research Team Testimonial**

“Multidisciplinary work allows researchers from different disciplines to combine their unique perspectives in investigating health issues that matter to patients.”

**- Nicole & Lydia**

# **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.



Model of stent application with dental restorations.



## MURPH Scholars

James Fowler  
Sebastian Sabry  
Mathias Labonte

## Principal Investigators

Physics  
Dr. Andrew Jirasek

School of Engineering  
Dr. Sepideh Pakpour

## Research Team Testimonial

“Working in a multidisciplinary team allows for unique solutions to solve complex problems as different backgrounds contribute novel ideas to the task at hand.”

**- James, Sebastian, & Mathias**



## **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**

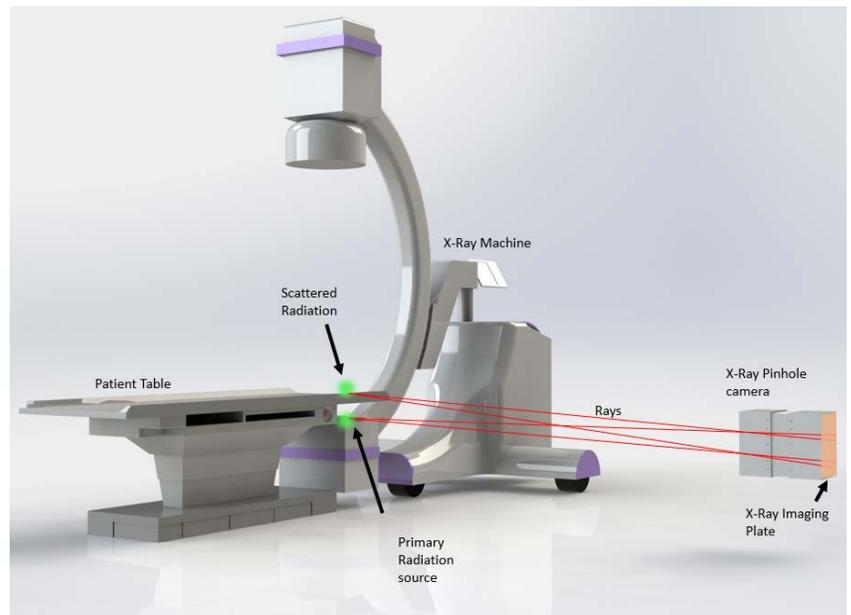
# **X-Ray Vision: Seeing Radiation from Medical Procedures**

## **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.



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.





**Please contact  
us to learn more  
about collaboration  
and sponsorship  
opportunities.**

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**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.**



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