



## UNDERGRADUATE SUMMER STUDENT RESEARCH PROGRAM (SSRP) 2021 PROJECT LIST

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\*\*\*Projects are posted in the order in which they are received. Please keep checking the website as this list may be added to until the application deadline\*\*\*

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## Summer Student Research Program Project Description

**Project #:** SSRP21-Min/Leung-01

**Supervisors:** Jason Min and Larry Leung

**Project Title:** Exploring student impact of a community-based approach to decolonizing and Indigenizing the pharmacy curriculum

**This project is only eligible for the Indigenous Undergraduate-SSRP (IU-SSRP) funding stream (i.e. only eligible Indigenous undergraduate students are invited to apply).**

The UPROOT project is a community-based approach to decolonizing and Indigenizing the pharmacy curriculum. This project seeks to strengthen, scaffold, and expand Indigenous content by creating two courses: (1) a mandatory pharmacy course on Indigenous health and wellness, (2) an elective course using a blended-model of Indigenous community-based learning and classroom teaching. Decolonization in this project refers to increasing Indigenous decision-making and control of building curriculum by changing existing Western approaches and structures. Indigenization will expand beyond Western pedagogical practices by building meaningful partnerships, reciprocity, and integrating Indigenous ways of knowing and learning. The curriculum is overseen by an advisory committee, comprised of Indigenous team members and partners, students, and non-Indigenous allies. The meaningful participation of our partners will ensure the approach, development, and evaluation of the project respects Indigenous knowledge, values, and practices.

In this SSRP position, the student will research the impact of the UPROOT project on pharmacy student learners, by participating in the following activities:

- Conduct a thorough literature review
- Collect and analyze quantitative and qualitative survey data
- Utilize a community-based participatory action research methodology for community partner engagement
- Interview Indigenous community partners and stakeholders
- Conduct talking circles and thematically analyze findings
- Create a summary report of key findings

The student will be integrated into the UPROOT team and expected to collaborate with the Indigenous Curriculum Advisory Committee, consisting of Indigenous and non-Indigenous experts, Indigenous community members and healthcare providers from participating Nations and undergraduate pharmacy students.

Qualifications:

- An Indigenous undergraduate student enrolled in an undergraduate program at the University of British Columbia
- Proficient knowledge of basic office computer software (e.g. Microsoft Word, Excel)
- Ability to show initiative, good judgement, time management skills, and professionalism
- Be able to work independently, and meet deadlines as agreed upon
- Excellent communication skills, both written and verbal
- Previous experiencing conducting literature reviews is an asset

## Summer Student Research Program Project Description

**Project #:** SSRP21-Wong-01

**Supervisor:** Dr. Judy Wong

**Project Title:** Tumor models of X-linked Dyskeratosis congenita

Work in my laboratory and others had shown that telomere maintenance defects in the bone marrow failure syndrome dyskeratosis congenita (DC) contributed to an increased risk of developing cancers. Our long-term collaboration with the Inherited Bone Marrow Failure Syndrome (IBFMS) clinical group at the National Cancer Institute provided us with the opportunity to model and study the cancer development process in DC.

Using primary patient materials collected by the IBFMS group, my laboratory will develop DC cancer models in the laboratory and study how these DC tumors overcome the innate genetic restrictions on telomere maintenance and achieve immortal growth. The long-term goal of this project is to provide new screening paradigm and to stratify treatment options for DC tumors, an unmet clinical need in the battles against the spectrum of disorders associated with this Bone Marrow Failure Syndrome.

The successful SSRP applicant will be supervised by members of the Wong laboratory, and conduct *in vitro* experiments to confirm tumorigenic transformation of the primary cell models, and perform cell-based characterizations of the malignant growth phenotypes in converted DC tumor cells.

## Summer Student Research Program Project Description

**Project #:** SSRP21-Hafeli/Larjava/Owen-01

**Supervisors:** Drs. Urs Hafeli/Hannu Larjava /Gethin Owen

**Project Title:** Manufacturing slow-release epidermal growth factor receptor inhibitor (Genfitinib)-containing microspheres

The goal is to develop slow-release drug for local treatment of periodontal disease that affects 30% of adult population. This is a joint project between the Faculties of Pharmacy and Dentistry. The student researcher will start the project in Pharmacy under the supervision of Professor Hafeli. The drug (Genfitinib) will be encapsulated into slow-release PLGA (poly lactic-co-glycolic acid) polymer microspheres, characterized for size distribution by particle size analyzer and SEM and tested for drug release. PLGA is a copolymer that is FDA approved for therapeutic devices due to its biodegradability and biocompatibility. Genfitinib is an EGFR inhibitor that has been approved for systemic used for some cancer therapies. It has recently come out of patent protection (2019).

After the drug has been successfully incorporated into the microspheres, the work will continue at the Faculty of Dentistry. The polymers will be placed into cell culture environment in which the inhibition of EGFR can be tested in various conditions. This part of the work will be supervised by Dr. Leeni Koivisto and Dr. Hannu Larjava.

## Summer Student Research Program Project Description

**Project #:** SSRP21-Turgeon-01

**Supervisor:** Dr. Ricky Turgeon

**Project Title:** Evaluation of written and multimedia medication educational resources for people living with heart failure

**Background:** An estimated 600,000 Canadians currently live with heart failure (HF), with many more remaining undiagnosed. HF is a condition that develops when the heart is not strong enough to move blood around the body. HF causes symptoms like extreme fatigue, shortness of breath, and swelling that make it difficult to perform normal activities, and severely impacts quality of life. People with HF have an increased risk of repeat hospitalizations and death. Currently, there is no cure for HF, but it can be successfully managed with medications, lifestyle changes, and medical devices. There are now over a dozen medication options for the treatment of HF. This variety and complexity of medication options for HF can overwhelm patients, their caretakers, and their healthcare providers. Ideally, medication educational materials for heart failure should facilitate discussions between patients and their healthcare providers by providing clear evidence-based information about treatment options that addresses patients' information needs. Based on our exposure to a variety of local, national and international heart failure medication educational materials, we hypothesize that the quality of materials is suboptimal and does not address many of the needs of people living with HF.

**Aim:** To collect, categorize, and evaluate existing written and multimedia educational materials available to people living with heart failure considering heart failure medications, with a particular focus on materials that described different treatment options.

**Importance:** The outputs of this project will be highly relevant and timely contributions to people living with heart failure, clinicians, and researchers. The results of this project will be used to inform the development of a decision aid for heart failure medications, as well as patient-centered medication educational resources for people living with heart failure. This project offers the opportunity to work with a multidisciplinary team of people with lived experience with heart failure, healthcare providers, and researchers.

**Project activities:** The project will involve:

1. Comprehensive search using Google.com to collect Internet-based educational materials about heart failure medications, supplemented by targeted manual searches of websites of key cardiovascular, heart failure, pharmacy, and patient advocacy organizations, as well as HF medication manufacturers, and the Ottawa decision aid inventory).
2. Online survey of HF clinicians from Canadian institutions (as identified by prior searches) for hospital-based materials.
3. Extraction of information from identified educational materials using established data collection procedures.

The project will offer a combination of key research methods including conducting a systematic review and online survey.

## Summer Student Research Program Project Description

**Project #:** SSRP21-Pearson-01

**Supervisor:** Dr. Marion Pearson

**Project Title:** Student and Faculty Perceptions of Student Workload in the E2P PharmD Program

Academic workload is a known stressor for students. However, the concept of workload is more complex than simply the number of hours spent in class and in independent study. Factors associated with workload include inherent difficulty of the subject matter, curricular structure, teaching methods, assessment strategies, institutional resources, and student characteristics such as language ability and motivation.<sup>1,2</sup> This project will examine perceptions of student workload in the E2P PharmD program and compare the perceptions held by students and faculty members to determine areas of congruence and divergence. Recommendations on how to mitigate the modifiable aspects of student workload may come out of this project.

This project will involve the following activities:

1. Literature review: Searching the scholarly literature on student workload in higher education generally and health professions programs specifically; using reference management software; completing a written review of the literature.
2. Research Ethics: Completion of the TCPS 2 2018 Course in Research Ethics and preparation of an application to the Behaviour Ethics Research Board.
3. Data collection and analysis: Designing and implementing a research protocol (likely an online questionnaire and semi-structured interviews and/or focus group questions); recording and analyzing data; developing recommendations based on findings.
4. Dissemination: Delivering a poster presentation and/or oral presentation to the Faculty and other audiences. There is also a possibility of contributing to the preparation of a manuscript suitable for publication.

The student undertaking this project will be expected to work effectively within general guidelines but with minimal direct supervision and to have excellent verbal and written communication skills.

### References:

1. Bowyer, K. A model of student workload. *Journal of Higher Education Policy and Management*. 2012 [cited 2013 Jan 15]; 34(3). Available from: <http://www.joe.org/joe/2002october/a1.php>.
2. Kember, D. Interpreting student workload and the factors which shape students' perceptions of their workload. *Studies in Higher Education*. 2004 [cited 2013 Jan 15]; 29(2). Available from: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1858618/>.

## Summer Student Research Program Project Description

**Project #:** SSRP21-Pachev/Verma-01

**Supervisors:** Drs. George Pachev and Arun Verma

**Project Title:** Students experience of complexity: Exploratory study using think-aloud technique and protocol analysis

**Goal:** The goal of this study is to explore how E2P PharmD students from different years of the program would evaluate and deal with pharmacy patient cases at complexity level beyond students' knowledge and skillset.

**Background:** Course development, assessment blueprinting and setting the assessment standards in the UBC PharmD E2P program are all guided by a matrix (a.k.a. cognitive model) specifying for each AFPC Education outcome the level of performance to be attained by the end of each year and the complexity of the patients and tasks, on which to perform at that level. Little is known, however, how students would deal with complex problems beyond their level of expertise, and whether students from different years of the educational program define the problem and deal with it in a similar way, when the complexity of the problem is beyond their knowledge and skillset.

### Research questions:

- How do students with different educational experiences in the E2P PharmD program handle a high-complexity case?
- What differences in defining, evaluating, and approaching a complex problem exist between students at different levels of expertise?

**Project activities:** This project will involve the student in the following activities:

1. Literature review refinement: searching the scholarly literature on complexity in health disciplines education, think-aloud technique for studying problem solving; incorporating the additional sources in the review.
2. Ethics approval and recruitment of participants: preparing documentation for submission to the Institutional Research Ethics Board, including letters of initial contact and consent forms.
3. Data collection and analysis: apply data collection protocols involving qualitative one-on-one online interviews with students from different years in the program and select clinical faculty. The successful candidate will gain experience in qualitative interviewing, application of the think-aloud techniques for data collection and their related analytical protocols.
4. Processing and summarizing of qualitative studies.
5. Dissemination of results: creating and developing a poster and seminar for presentation to the Faculty and other audiences, and participating in the preparation of a manuscript suitable for publication.

The student undertaking this project will be expected to work effectively within general guidelines but with minimal direct supervision and to have excellent verbal and written communication skills.

## Summer Student Research Program Project Description

**Project #:** SSRP21-Ross-01

**Supervisor:** Dr. Colin Ross

**Project Title:** Optimization of novel strategies for therapeutic genome editing using lipid nanoparticle delivery of CRISPR/Cas9 base editing components to an *in vitro* reporter model

**Background:** Genome sequencing has aided our ability to understand and diagnose genetic diseases and cancer. However, less than 5% of human genetic diseases have approved treatments. Previously, gene therapies have focused on the treatment of genetic diseases by inserting functional copies of a gene into patient cells. While this approach has been successful, critical limitations remain.

**Project Overview:** To overcome these limitations, we are investigating the potential of using novel CRISPR/cas9 gene editors to specifically repair pathogenic mutations directly in the DNA sequence of the gene of interest. In order to optimize this novel approach, we have developed an *in vitro* reporter model system that utilizes repairable mutations in fluorescent genes to evaluate nanotechnology-based approaches to deliver therapeutic components into cells.

**Methods:** This project will require UBC biosafety and chemical safety training. The project involves lab-based molecular biology techniques, imaging, and bioinformatics-based analyses. Students will learn mammalian cell culture techniques, fluorescent imaging, luminescence assays and flow cytometry. In addition, the project will require quantitative data analyses and the application of statistics to summarize laboratory findings. Finally, the project will require detailed presentations of findings in weekly lab meetings and reporting of project findings.

**Role of the Summer Student:** The summer student will work closely with the supervisor, research associates/postdoctoral fellows and graduate students to complete the project. The research will involve significant laboratory-based research involving bacteria and mammalian cell lines. The role of the summer student will be to utilize *in vitro* reporter models to perform optimization experiments to improve gene editing efficiency. In addition, the summer student will assist in the further development of the *in vivo* mouse models by developing and conducting genotyping assays. These important foundational experiments using the cell lines will be applied to all subsequent disease models and *in vivo* mouse studies in the future. The summer student will be expected to participate in weekly lab meetings and prepare a final report and poster presentation.

## Summer Student Research Program Project Description

**Project #:** SSRP21-Ross-02

**Supervisor:** Dr. Colin Ross

**Project Title:** Development of an *in vitro* model of Lipoprotein Lipase Deficiency (LPLD) to investigate the therapeutic efficacy of CRISPR/cas9 genome editing

**Background:** Genome sequencing has aided our ability to understand and diagnose genetic diseases and cancer. However, less than 5% of human genetic diseases have approved treatments. LPLD is a rare autosomal recessive disorder, which affects the body's ability to metabolize fats. Previously, Dr. Ross helped develop a gene therapy for LPLD known as Glybera, which aimed at treating the genetic diseases by inserting functional copies of the LPL gene into patients. While this approach was successful and gained clinical approval, critical limitations remained.

**Project Overview:** To overcome these limitations, we are investigating the potential of using novel CRISPR/cas9 gene editors to directly repair a pathogenic mutation in the DNA sequence of the LPL gene. In order to evaluate and later optimize this novel approach, we are developing an *in vitro* disease model.

**Methods:** This project will require UBC biosafety and chemical safety training. The project involves lab-based molecular biology techniques, imaging, and bioinformatics-based analyses. Students will learn mammalian cell culture techniques, cloning techniques and analysis of enzymatic assays. In addition, the project will require quantitative data analyses and the application of statistics to summarize laboratory findings. Finally, the project will require detailed presentations of findings in weekly lab meetings and reporting of project findings.

**Role of the Summer Student:** The summer student will work closely with the supervisor, research associates/postdoctoral fellows and graduate students to complete the project. The research will involve significant laboratory-based research involving bacteria and mammalian cell lines. The role of the summer student will be to generate *in vitro* models of LPLD using cloning and transfection techniques. In addition, the student will use CRISPR/cas9 to correct the mutation and compare enzymatic activity to the wildtype levels. This exciting summer project will demonstrate proof-of-principle gene correction and will be the foundation for the development of a subsequent patient cell line model and *in vivo* mouse model. The summer student will be expected to participate in weekly lab meetings and prepare a final report and poster presentation.

## Summer Student Research Program Project Description

**Project #:** SSRP21-Conklin-01

**Supervisor:** Dr. Annalijn Conklin

**Project Title:** Examining the role of ethnic identity for teen health

**This project is only eligible for the Indigenous Undergraduate-SSRP (IU-SSRP) or Enhanced Opportunities Undergraduate-SSRP (EOU-SSRP) funding streams (i.e. only eligible undergraduate students from populations that have been historically, persistently or systemically excluded from higher education, including those who identify as: Indigenous, Black or People of Colour, Trans, Two-Spirit or Gender Diverse, Persons with Disabilities, or First Generation Students (i.e. the first person in your family to attend higher education) are invited to apply).**

Research has shown ethnic disparities in physical and mental health, but findings are often mixed. Moreover, broad ethnic identity categories may be less informative for understanding disparities in health than the psychosocial process of ethnic identity development. Differences in the salience of ethnic identity seem particularly relevant to examining health disparities in multicultural, multigenerational settings such as BC.

The purpose of this project is to examine the associations between ethnic identity and mental or physical health among adolescents. The project will use previously collected data from a population-based cohort of youth who reported on social, psychological and behavioural variables every six months between 2009 and 2012. The aim is to assess whether ethnic identity, using a two-factor model of the Multigroup Ethnic Identity Measure (MEIM, Phinney 1992), is associated with depression scores or self-reported health in young women and young men.

This project will include key research methods and skills, such as literature review, quantitative data analysis (i.e. descriptive statistics and multivariable regression), and interpretation and synthesis of findings. The planned outputs will be an abstract for conference submission and an outline of a manuscript for future development and submission.

## Summer Student Research Program Project Description

**Project #:** SSRP21-Wilbur-01

**Supervisor:** Dr. Kerry Wilbur

**Project Title:** Health Advocacy in Pharmacy Student Practice

**This project is only eligible for the Indigenous Undergraduate-SSRP (IU-SSRP) or Enhanced Opportunities Undergraduate-SSRP (EOU-SSRP) funding streams (i.e. only eligible undergraduate students from populations that have been historically, persistently or systemically excluded from higher education, including those who identify as: Indigenous, Black or People of Colour, Trans, Two-Spirit or Gender Diverse, Persons with Disabilities, or First Generation Students (i.e. the first person in your family to attend higher education) are invited to apply).**

Health advocacy encompasses direct service to the individual or family as well as activities that promote health and access to health care in communities and the larger public. Health advocates support and promote the rights of the patient in the health care arena, help build capacity to improve community health and enhance health policy initiatives focused on available, safe and quality care.

Health advocacy has become an increasingly important component of health professions training in Canada, either explicitly or as a defined set of competencies. In pharmacy, ADVOCACY is one of the eight core competency roles for which students across Canada are trained. However, there are gaps in our undergraduate Doctor of Pharmacy (PharmD) curriculum at UBC. Diary data collected among fourth year pharmacy students during their hospital and community clerkship experiences (2018-2019) demonstrated mistaken conceptualization of health advocate roles for patients.

In 2019, a health advocacy workshop was developed and delivered by multidisciplinary members of UBC Health across affiliated health professional programs. This program was first offered in-person during 2019/2020 and again (virtually) in 2020/2021 during the Program Enrichment Activity Days (PEADS) component of our undergraduate PharmD curriculum to students for students in second year. Pharmacy students practiced using a structured framework to consider authentic examples of health advocacy and engaged with patient partners and their lived experiences.

This SSRP project will repeat data collection among year 2 and year 3 enrolled in clerkship courses during the summer to determine if there is any shift in health advocacy conceptualization or recognition of advocacy opportunities for patients and families.

| Student Roles                                                                                                                                                                                                                                                                                                                       | Student Benefits                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"><li>• Familiarize &amp; further synthesize current available data</li><li>• Review renewed Institutional Review Board (ethics) approval</li><li>• Support participant recruitment and consent processes</li><li>• Manage data collection platform and engage with research participants</li></ul> | <ul style="list-style-type: none"><li>• Exercise organizational and critical thinking skills</li><li>• Learn qualitative (text) data coding and analysis</li><li>• Augment academic writing skills (publication)</li><li>• Develop confidence identifying &amp; addressing practice- and/or education-based research questions</li><li>• Deepen understanding of pharmacist roles in health advocacy, including how undergraduates contribute to this care during clerkship courses</li></ul> |

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|------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"><li>• Analyze new data and contrast with currently available data</li><li>• Develop manuscript for publication</li></ul> | <ul style="list-style-type: none"><li>• Contribute to curriculum enhancement for pharmacy education</li></ul> |
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This project is designed to be conducted virtually, if required. Interested students do not need to reside in the Lower Mainland and time for tasks is flexible. An important project goal is for student to have fun while researching.

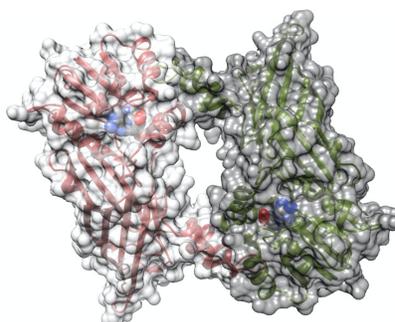
## Summer Student Research Program Project Description

**Project #:** SSRP21-Frankel-01

**Supervisor:** Dr. Adam Frankel

**Project Title:** Conjugation of arylalkylamine scaffolds to synthesize PRMT2 inhibitors

Protein arginine *N*-methyltransferases (PRMTs) catalyze the transfer of methyl groups from *S*-adenosyl-L-methionine to arginine residues on proteins important for the epigenetic regulation of transcription, RNA processing, and signal transduction.<sup>1</sup> Dysregulation of arginine methylation is implicated in a number of different cancers for which several research groups have developed PRMT-specific inhibitors as potential therapeutics.<sup>2</sup> In recent years, human PRMT2 was shown to be involved in the pathogenesis of glioblastoma multiforme (GBM), an aggressive brain cancer with a low survival rate.<sup>3</sup> Our laboratory demonstrated hPRMT2 *in vitro* activity for the first time in 2009;<sup>4</sup> however, it is too low to support activity-based screening. We have embarked on a drug discovery campaign using molecular modelling and biophysical techniques to identify hPRMT2-targeted inhibitors based on a handful of derivatized arylalkylamine scaffolds. For this summer student research project, we plan to use conjugation chemistry methods already established in our lab to create a small library of



hPRMT2 homodimer

compounds to test for hPRMT2 binding and activity inhibition. In addition to the synthesis of these compounds, their purity will need to be assessed by mass spectrometry and NMR. The outcome of this work represents the first step in the journey to developing a means to target GBM through hPRMT2 inhibition.

### References

1. Blanc, R. S. & Richard, S. Arginine Methylation: The Coming of Age. *Molecular Cell* **65**, 8–24 (2017).
2. Jarrold, J. & Davies, C. C. PRMTs and Arginine Methylation: Cancer's Best-Kept Secret? *Trends in Molecular Medicine* **25**, 993–1009 (2019).
3. Dong, F. *et al.* PRMT2 links histone H3R8 asymmetric dimethylation to oncogenic activation and tumorigenesis of glioblastoma. *Nature Communications* **9**, 4552 (2018).
4. Lakowski, T. M. & Frankel, A. Kinetic analysis of human protein arginine *N*-methyltransferase 2: formation of monomethyl- and asymmetric dimethyl-arginine residues on histone H4. *The Biochemical Journal* **421**, 253–261 (2009).