**Summer Student Research Program**

**Project List 2020**

**List updated:** January 21, 2020

***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 deadline***

**Projects:**

<table>
<thead>
<tr>
<th>Project Number</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSRP-Lalji-01</td>
<td>Antimicrobial Consumption in BC and Ontario</td>
<td>2</td>
</tr>
<tr>
<td>SSRP-Page-01</td>
<td>Developing new anti-cancer therapies using state of the art chemical biology techniques</td>
<td>3</td>
</tr>
<tr>
<td>SSRP-Li-01</td>
<td>Development of a safe and effective pain killer</td>
<td>4</td>
</tr>
<tr>
<td>SSRP-Li-02</td>
<td>Creating visual effects to promote knowledge translation of the nanomedicine research projects</td>
<td>5</td>
</tr>
<tr>
<td>SSRP-Min/Leung-01</td>
<td>Entry-to-Practice PharmD Interprofessional Education Program Evaluation</td>
<td>6-7</td>
</tr>
<tr>
<td>SSRP-Ross-01</td>
<td>Generation of an in vitro model of Lipoprotein Lipase Deficiency (LPLD) to investigate the therapeutic efficacy of the newly developed CRISPR/cas9 prime editors</td>
<td>8</td>
</tr>
<tr>
<td>SSRP-Ross-02</td>
<td>Optimization of novel strategies for therapeutic genome editing using in vitro and in vivo reporter model</td>
<td>9</td>
</tr>
<tr>
<td>SSRP-Cragg-01</td>
<td>Drug Safety for Neurological Diseases</td>
<td>10</td>
</tr>
<tr>
<td>SSRP-Pachev/Gerber/Verma-01</td>
<td>Validating the educational use of a patient case complexity measure: Teachers’ evaluation of patient case complexity and the cases’ educational use</td>
<td>11-12</td>
</tr>
<tr>
<td>SSRP-Pachev/Gerber/Verma-02</td>
<td>Validating the educational use of a patient case complexity measure: Students recognition of and dealing with complexity of patient cases</td>
<td>13-14</td>
</tr>
</tbody>
</table>
Summer Student Research Program Project Description
SSRP-Lalji-01

**Supervisor:** Dr. Fawziah Lalji

**Project Title:** Antimicrobial Consumption in BC and Ontario

**Project Description:** The World Health Organization declared that antimicrobial resistance (AMR) had reached a crisis status in 2014. The emergence of “superbugs” resistant to many, or all available antibiotics has made AMR one of the most pressing public health crises today. Antibiotics are essential medications for the practice of modern medicine, and preserving their efficacy is a global priority. Within Canada, overall antibiotic prescribing is decreasing in the community, both in adults and children, as a result of improved education and stewardship efforts. Although prescribing has decreased, when compared to the far lower prescribing rates in Europe, increasingly substantive change is known to be achievable. The premise of our study is that although the quantity of antibiotics used has been monitored for over two decades, the quality of these prescriptions has yet to be described at population level throughout the world. Antibiotic prescribing in the absence of a bacterial etiology, the overuse of broad-spectrum agents, and suboptimal dosing and duration of therapy are defining features of inappropriate antibiotic use. Antibiotics are most often prescribed for respiratory tract infections (RTI), followed by urinary tract infections (UTI), and skin and soft tissue infections (SSTI); the estimated rate of inappropriate prescribing is high, particularly for upper RTIs, which are self-limiting illnesses, often caused by viruses.

For the SSRP, the student is anticipated to work with a PHD student on a sub-project of aim 1, which is to establish a baseline of the overall prescribing rate of antibiotic prescriptions over time in British Columbia and Ontario. This project will be to look at NACARS data which is data from patients in emergencies.

**Skills Required:** The student will be required to use SAS for data analysis, and use critical thinking skills to analyze and evaluate data outputs. Student should have excellent communication skills, particularly being prepared to write a manuscript based on the study results.
**Summer Student Research Program Project Description**

**SSRP-Page-01**

**Supervisor:** Dr. Brent Page

**Project Title:** Developing new anti-cancer therapies using state of the art chemical biology techniques

**Project Description:** A project is available focused on the design, synthesis and preliminary testing of novel chemical compounds to target dysfunctional signaling networks in cancer cells. This project has evolved from high-throughput screening campaigns and have employed state of the art chemical biology techniques including cellular thermal shift assays (CETSA), thermal proteome profiling (TPP), fluorescence tagging and other cutting-edge techniques. Compounds that are synthesized within this project will be analyzed for their ability to bind specific targets in cancer cells and for their ability to halt the growth and proliferation of cancer cells using the latest models and technologies.

Summer students will gain exposure to a breadth of topics in drug discovery and development within these projects and will learn the basics of medicinal and organic chemistry (including synthesis and characterization of new compounds), chemical and cell biology techniques (including CETSA and cell proliferation assays), and will interact with a network of collaborators who will further assess the anti-cancer activity of newly synthesized compounds.
Supervisor: Dr. Shyh-Dar Li

Project Title: Development of a safe and effective pain killer

Project Description: About 6 million Canadians report a form of chronic pain, yet half of the sufferers do not get enough pain relief from their medications. This severely affects their quality of life and has significant social and economic burdens. Opioid medications, such as morphine, are the most powerful pain killers available, but these drugs also cause serious side effects, such as suppressed breathing, leading to a high risk of death from overdose. In 2016, there were 2,861 opioid overdose deaths in Canada, and British Columbia (BC) reported the highest opioid-related death rate, which was three times the national average. The overdose rate in BC increased 17 fold from 2011 to 2016. This worsening opioid epidemic resulted in changes in opioid prescribing standards, and half of the chronic pain sufferers can no longer access opioid drugs in BC. Dr. Li’s team is synthesizing new, effective, and safe compounds for chronic pain relief. They are aiming to develop a new drug that will improve pain relief options and access for patients who suffer from chronic pain. Dr. Li is looking for a student who has experience in conducting behavior studies (e.g. hot plate, von Frey test, breathing rate measurement, formalin injection test…) in mice to assist in evaluating the safety and efficacy of their new compounds.
Summer Student Research Program Project Description
SSRP-Li-02

Supervisor: Dr. Shyh-Dar Li

Project Title: Creating visual effects to promote knowledge translation of the nanomedicine research projects

Project Description: The student will work under direct supervision by Dr. Shyh-Dar Li at the Faculty of Pharmaceutical Sciences to create visual effects (e.g. videos, graphical abstracts, illustrative diagrams...) to convey significance of the research and technologies pursued and developed by Dr. Li’s laboratory to perspective graduate students, the research community, lay public and investors. S/he will contribute to ongoing projects in the lab, including:

- Developing child-friendly oral formulations for poorly soluble drugs.
- Developing nanoparticles for delivering drugs to tumors for targeted therapy or immunotherapy.
- Developing a safe and effective pain killer.

For details, please visit the lab webpage: http://pharm-labtddn.sites.olt.ubc.ca/

Preference will be given to students who has experience in wet-lab research training and creating engaging and easy-to-understand visual effects, especially short videos.
Summer Student Research Program Project Description
SSRP-Min/Leung-01

Supervisors: Jason Min and Larry Leung

Project Title: Entry-to-Practice PharmD Interprofessional Education Program Evaluation

Background: Interprofessional Education (IPE) at the University of British Columbia (UBC) Faculty of Pharmaceutical Sciences is under the portfolio of the Office of Experiential Education (OEE). IPE occurs when students, healthcare workers, or health professionals from two or more disciplines work collaboratively to “learn about, from and with each other to enable effective collaboration and improve health outcomes” World Health Organization, 2010. Our vision for IPE is to become a global leader in a competency-based program in the Entry-to-Practice PharmD, that is integrated and collaborative, to support students in becoming effective interprofessional collaborators in patient care.

The Entry-to-Practice PharmD curriculum includes required intra- and interprofessional learning experiences, which are embedded throughout the professional program. In order to ensure that the IPE program is meeting our vision, a mixed-methods evaluation plan was developed in 2019/2020. The mixed-methods study design will use surveys and focus groups to:

Project Overview:
The purpose of this SSRP project is to:
- Understand the impact of IPE activities on student self-reported skills, attitudes, beliefs and knowledge
- Determine if differences exist depending on program year level
- Evaluate the effectiveness of the IPE activities on IPE learning outcomes

Project Activities:
The student researcher will participate in the following three main activities as part of this evaluation:

1) Survey Data Collection and Analysis
   - Analyze key findings from survey data from program year levels 1, 2, 3 and 4
   - Conduct a thematic analysis of findings

2) Student focus groups
   - Organize and deploy student focus groups to further evaluate student self-reported skills, attitudes, beliefs and knowledge of IPE objectives
   - Analyze key findings from focus group data
   - Conduct a thematic analysis of findings

3) Summary report of findings
   - Create a summary report of key findings from surveys and focus groups, including areas of strength and areas for improvement
Expected Outcomes:

- **Short term:** better understanding of strengths and areas of improvement in current program
- **Medium term:** provide more impactful IPE activities
- **Long term:** Evaluation shows prepared health professionals (re: skills, knowledge and behaviours) to work in a collaborative team to improve patient care
**Summer Student Research Program Project Description**

**SSRP-Ross-01**

**Supervisor:** Dr. Colin Ross

**Project Title:** Generation of an *in vitro* model of Lipoprotein Lipase Deficiency (LPLD) to investigate the therapeutic efficacy of the newly developed CRISPR/cas9 prime editors

**Project Description**

**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 (specifically prime editing) to directly repair a pathogenic mutation in the DNA sequence of the LPL gene. Prime editing is reported to be a safer and more flexible approach to repairing pathogenic mutations compared to the previous technologies. However, due to the newness of this technology (published in Nature, Winter 2019), there is a lot of optimization and learning to be done. This project will require perseverance and troubleshooting skills, but with hard work and dedication is likely to yield very exciting results.

**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 brand new 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
SSRP-Ross-02

Supervisor: Dr. Colin Ross

Project Title: Optimization of novel strategies for therapeutic genome editing using in vitro and in vivo reporter model

Project Description

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, specifically the base editors, to repair pathogenic mutations directly in the DNA sequence of the gene of interest. In order to optimize this novel approach, we are currently developing in vitro and in vivo reporter model systems that utilize the GFP and luciferase genes to evaluate nanotechnology-based approaches to deliver therapeutic components into cells. This exciting project has already yielded fruitful results, but many opportunities for different optimization strategies remain unexplored. This project will require students to be independent, creative and thoughtful in designing their own series of experimental questions to answer throughout the summer semester.

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 generate in vitro reporter models and perform optimization experiments to improve gene editing efficiency. In addition, the summer student may 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.
Supervisor: Dr. Jacquelyn Cragg

Project Title: Drug Safety for Neurological Diseases

Project Description

Background and Objectives: Individuals with neurological diseases experience a range of secondary complications including pain, fatigue, bladder dysfunction, depression, and spasticity. Along with disease modifying therapies, these complications are treated with various medications. However, the neurologic effects of these commonly used medications represents a major knowledge gap. This is surprising given that many medications are centrally acting, and are administered during rapid changes in neurologic function. Another major knowledge gap is how these medications interact with disease-modifying therapies. The goal of this project is to understand how commonly used medications affect long term neurological outcomes in a range of neurological diseases.

Methods: This project will involve both a literature review and an application of statistical methods to understand neurological disease progression, using historical human clinical trial data. The project will also involve a review of medical records to classify concomitant medications.

Skills Developed: The SSRP student will learn (or further develop) skills in literature searching, statistical software, data analysis, drug groupings, and data visualization.

Qualifications: an interest in learning about statistical analyses. No prior experience with statistical software is needed.
Summer Student Research Program Project Description
SSRP-Pachev/Gerber/Verma-01

**Supervisor(s):** George Pachev, Patricia Gerber, Arun Verma

**Project Title:** Validating the educational use of a patient case complexity measure: Teachers’ evaluation of patient case complexity and the cases’ educational use

**Project Description**

**Goal**
The goal of this study is to explore how teachers in the E2P PharmD program evaluate the complexity of patient cases that have been specially designed to portray different level of patient case complexity.

**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. Calibrating the patient cases used for teaching or assessment to the prescribed level of complexity has proven difficult, only recently there have been attempts in the program to use a tool for measuring complexity of patient cases. The application of this tool requires exploration of its measurement properties and validation of its use. The current project is a part of this validation work. It seeks to explore how teachers in the program evaluate the complexity of patient cases that have been specially designed using the measurement tool, to represent different levels of complexity.

**Research questions**
How congruent are the levels of complexity of patient cases as judged by faculty experts with the level of cases’ complexity that is built in the cases?

What aspects of the cases, according to faculty experts, make a case more or less complex?

What aspects of complexity embedded in the measurement tool, can be used to generate patient cases at the low, low-moderate, and moderate level of complexity?

Do faculty experts designate cases of low, low-moderate, and moderate complexity (as measured with the tool), for educational use with students in PY1, PY2, and PY3 of the PharmD program, respectively?

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

1. Literature review refinement: searching the scholarly literature on the concept of complexity in education and its use in health disciplines education; incorporating 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: apply data collection protocols involving paired-comparisons for ranking techniques and qualitative one-on-one interviews with educators from the program. The successful candidate will gain experience in qualitative interviewing, think-aloud protocols and paired comparisons/ranking techniques.

4. Processing and summarizing of results.

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
SSRP-Pachev/Gerber/Verma-02

Supervisor(s): George Pachev, Patricia Gerber, Arun Verma

Project Title: Validating the educational use of a patient case complexity measure: Students recognition of and dealing with complexity of patient cases

Project Description:

Goal
The goal of this study is to explore how students in the E2P PharmD program would evaluate and deal with patient cases that are built to represent different levels of complexity.

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. Calibrating the patient cases used for teaching or assessment to the prescribed level of complexity has proven difficult, only recently there have been attempts in the program to use a tool for measuring complexity of patient cases. The application of this tool requires exploration of its measurement properties and validation of its use. The current project is a part of this validation work. It seeks to explore how pharmacy students from different years of the program would evaluate the complexity of patient cases built to represent different levels of complexity, and how would they deal with cases’ complexity in the context of different professional tasks.

Research questions
How congruent are the levels of complexity of patient cases as judged by students from PY1, 2 and 3, with the level of cases’ complexity built in the cases?
Is the ability of UBC PharmD students to recognize patient case complexity related to student year level?
What are the effects of task complexity on students’ dealing with complexity (i.e., ability of student to correctly identify complexity, student perception of task difficulty)
What aspects of the cases, according to students, make a case more or less complex?

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

1. Literature review refinement: searching the scholarly literature on complexity in education and its use in health disciplines education; incorporating 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: apply data collection protocols involving paired-comparisons for ranking techniques and qualitative one-on one interviews with educators from the program. The successful candidate will gain experience in qualitative interviewing, think-aloud protocols and paired comparisons/ranking techniques.

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