UBC SPARC Resource
CIHR Project Grant: Research Proposal Best Practice Examples

Last updated on July 10, 2023 for the Fall 2023 CIHR Project Grant competition.

This resource includes examples of effective text from successful Project Grant applications generously shared by UBC researchers. Sample text is grouped into five categories relevant to the Research Proposal and Proposal Information.

1. Potential Limitations and Alternative Approaches
2. Gantt Charts and Timelines
3. Knowledge Translation Plans
4. Impact Statements
5. Priority Announcement Relevance Forms

For additional ideas, consult SPARC's Sample Grant Library (CWL required).

Six Examples of Effective Potential Limitations and Alternative Approaches Text

1) Clear discussion of mitigation strategies:

Expected Outcome, Caveats & Mitigation: We expect that differences in local insulin, or local insulin signalling, will increase the proliferation of cells that comprise the acinar, PanIN, and stromal compartments throughout the course of the disease. We expect to identify corresponding mitogenic and pro-survival changes in gene expression in single cells from these compartments and validate the changes at the protein level. One caveat of single cell transcriptomics is that genomic coverage remains incomplete despite newer chemistry. However, mitogenic and pro-survival pathways are typically well represented in single-cell RNAseq datasets and we don't anticipate significant pitfalls. We will compare cell type composition in our RNAseq datasets to cell type data from our stained pancreas sections to assess whether the dispersion protocols bias towards specific cell types. If so and in the event that this affects the interpretation of our single-cell RNAseq data, we may optimize bespoke protocols to focus on under-represented cell types. We will draw on our considerable expertise isolating islet cells from pancreas[128-130]. Another potential mitigation approach would be to employ single-nucleus sequencing, using recently published methods said to be optimized for the exocrine pancreas126. Given the fact we already have pilot single-cell sequencing data (Fig.6), we are confident we can optimize these protocols for our model.

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2) Detailed discussion of potential challenges:

Anticipated results, considerations, & alternative strategies: I expect that SHIP activity will be lower and PI3Kp110δ activity will be higher in PBMCs and biopsies from CD patients with fibrosis compared to those, who do not have fibrosis. It will be exciting to see whether this correlation also exists in some people, who are deemed at risk of developing fibrosis according to the Montreal classification. It is possible that finding inflamed and uninflamed control biopsies from each patient will not be possible, which is why we have included twice as many patients as we anticipate needing for analyses. Additional/excess biopsies (or patients) can be committed to additional ex vivo stimulations, as in our

previous work [11]. Additional stimulations would include LPS + ATP for IL-1β, and IL-13 for IL-33[11, 46]. Finally, increased fibrosis in people with low SHIP activity may result from more severe disease, rather than as a direct consequence of increased PI3Kp110δ activity, which would implicate SHIP deficiency as a biomarker for severe, fibrotic, and perhaps treatment-refractory disease.

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3) In-depth discussion of the feasibility of addressing potential challenges:

Feasibility and pitfalls for Aim 4: We have an ongoing collaboration with Jeff Mogil and assays for mechanical allodynia and thermal hyperalgesia are well established in my lab. AMG517 and SB705498 are available commercially. We recognize that in vivo studies maybe complicated by direct effects of the gene deletions (i.e. some knock-out strains may have defects in axon degeneration pathways that result in supernumerary fibers within the epidermis and/or altered pain responses) and recognize that it will be important to establish robust baseline measures in null strains prior to paclitaxel treatment. TheTRPV1strain is problematic as it has defects in detecting thermal pain –for this strain, we will limit our analyses to paclitaxel-induced axon degeneration in vitro. Finally, we recognize that some of the null strains may not survive to adulthood; if sensory neurons derived from such strains show strong resistance to paclitaxel in vitro, we will consider obtaining/generating conditional alleles of these strains and crossing them our Advillin-cre strain for additional in vivo and in vitro studies.

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4) Detailed discussion of how pitfalls will be addressed:

Pitfalls: Multi-metric analysis introduces additional degrees of freedom, while the number of data samples remains the same. The added degrees of freedom (or dimensions) could result in over-fitting, which may affect predictive performance (curse of dimensionality). Aside from our routine use of training, validation and test sets, as a solution to overfitting, we will explore principal component analysis (PCA) or selective filtering [121] in combination with regularized regression, namely LASSO and Ridge regression. In fact, our group has pioneered the development of PCA-LASSO and its application to voxel-level PET image analysis [122]. We will perform cross-validated PCA-LASSO and/or LASSO alone to perform robust simultaneous feature selection and model fitting, followed by model testing on the test set. Statistical power is assessed based on a two-sided Z test between two groups of subjects defined by the primary outcome, i.e. ‘responder vs. ‘non-responder. A feature with prediction accuracy below 75% would not warrant further investigation, whereas a feature that achieves at least 85% prediction accuracy would be considered as having potential clinical utility. A sample size of at least 160 subjects would have 80% power (significance level 0.05) to test the alternative hypothesis that a feature has an accuracy higher by 10% or more against another test. Our international collaborative effort more than guarantees such sample sizes for our initially derived predictive biomarkers.

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5) Discusses prior feasibility of addressing pitfalls:

Non-hockey control subjects may sustain a concussion during the study and will be removed from the pool of non-concussed control subjects, with a new control subject recruited. In addition, in the 11 concussed subjects from the pilot study, one subject had a repeat injury (the analysis only included the unique first concussions). We have already accounted for this rate of repeat concussions in sample size calculations and also conservatively estimated 30 unique concussions over 3 years, and we will separately analyze unique first concussions from repeat concussions. Furthermore, head impact sensors may sometimes be damaged or lost during play. If any sensor information is lost due to damage or loss, we will review game/practice video to determine number and qualitative severity of impacts, and use the rest of the sensor data to extrapolate kinematics information. While we consider impact exposure not leading to clinical concussions as subconcussive, during biweekly neurocognitive testing or post-season testing, if research staff notice concussion signs or substantial drops in test performance, they will consult PIs for potential clinical referral. One other consideration is that we do expect subconcussive head impact exposure to have milder and more transient effects than concussions, which may be difficult to capture107–109.The biomechanics information helps us identify players who sustain substantial exposure to impacts (from those with few or infrequent impacts over the season), which is different from study designs that may lump all players into one exposure group. Frequent and high-severity exposures are more likely to lead to measurable outcomes, and we can identify and examine a high exposure group from our cohort.

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6) Succinctly outlines limitations:

Limitations: The composition of HFD can vary in fibre116 and we will work with Research Diets to ensure these diets are equivalent in all factors except fat. HT could be given throughout the 3-month diet but the timing of HT would then differ from Expt 1&2.

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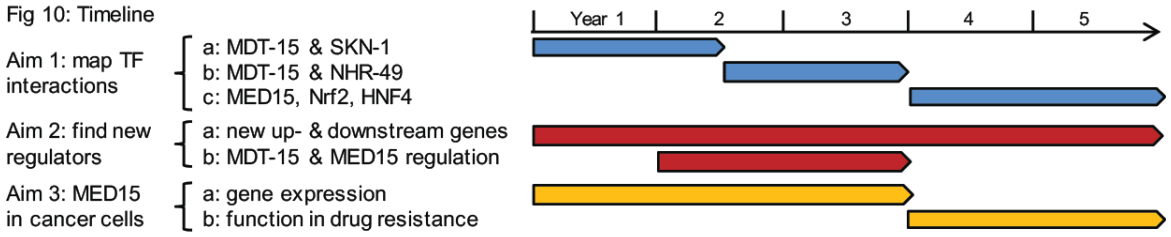
Six Examples of Effective Gantt Charts and Timelines

1) Simple and effective use of arrows displayed in different colours to illustrate independence of aims:

3. TIMELINE: Our three aims are independent and will hence be pursued concurrently.



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2) Simple and effective table presentation:

Timeline: The three aims are necessary to establish a complete picture of immune influence on ALL, but successful completion of each is independent of the others.

Activity	AIM	Topic	Year 1	Year 2	Year 3	Year 4	Year 5
BCP depletion	1A	Effector mechanisms					
	1B	TLR agonists					
	1C	Depletion in adults					
BCP expansion	2A	Leukemia progression					
	2B	Mechanisms of expansion					
Human responses	3A	Cord blood studies					
	3B	MRD studies					

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3) Activities and aims incorporated within "boxes' alongside "Deliverables" for each aim:

Both aims are independent of each other and will follow the timeline depicted in Figure 9. Aim 2C will use some of the ESC lines developed in Aim 1A and will follow the completion of that Aim.

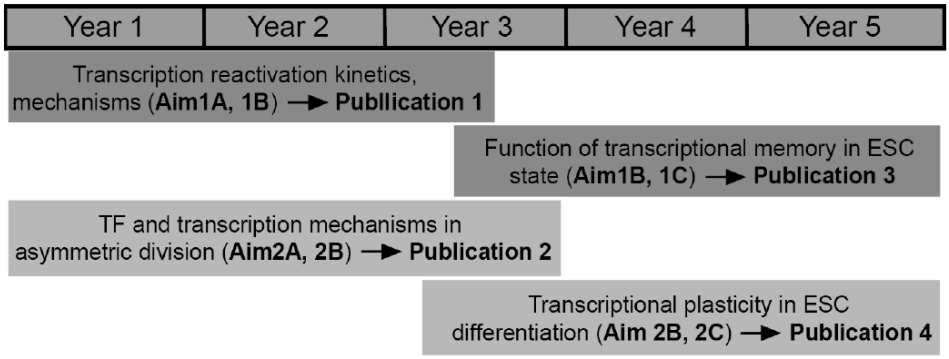

Figure 9 Timeline for proposed project and anticipated publications

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4) Incorporates KT activities and "Deliverables" for each aim (abbreviated as "T1-3"):

7 Project Timeline

	Y1	Y2	Y3	Y4	Y5	Y6
Study set up + participant recruitment						
Screening and data collection T1						
Participant retention (social events etc.)						
Data analysis						
Write, submit and revise paper						
Deliverable #1: Publication of research (e.g., cross-sectional baseline data) in peer-reviewed journal						
Data collection T2						
Data analysis						
Write, submit and revise paper						
Deliverable #2: Publication of research (e.g., cross-sectional data at T2) in peer-reviewed journal						
Data collection T3						
Data analysis						
Write, submit and revise paper						
Deliverable #3: Publication of research (e.g., longitudinal results) in peer-reviewed journals						
Knowledge translation						
Main Deliverables: Broad dissemination of scientific knowledge to academic and public audiences; education of young women at events and with help of menstrual diary app; posts on CeMCOR website						

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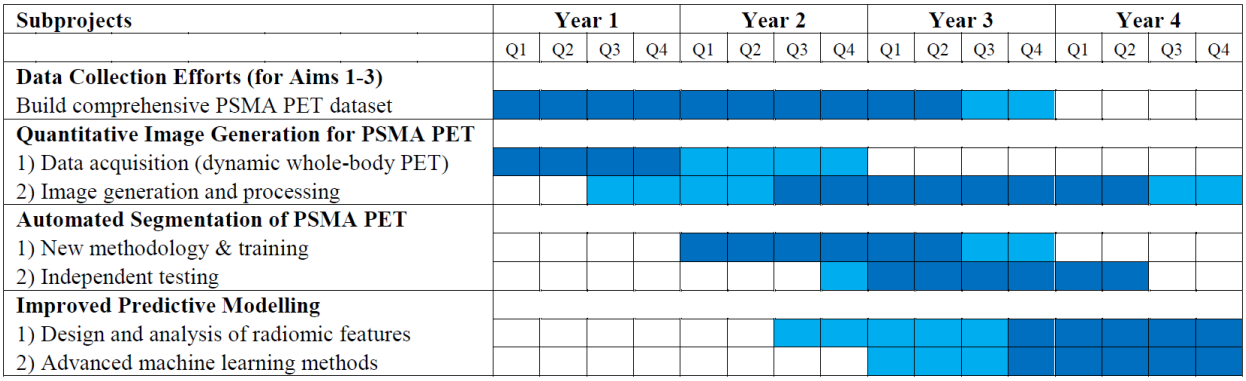
5) Timeline displayed by quarter and by periods of "intense activity":

2.4. Timeline: A timeline of sub-projects is shown here. Each column indicates one quarter. A dark blue indicates more intense effort during the period.



Subprojects	Year 1				Year 2				Year 3				Year 4			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Data Collection Efforts (for Aims 1-3)																
Build comprehensive PSMA PET dataset																
Quantitative Image Generation for PSMA PET																
1) Data acquisition (dynamic whole-body PET)																
2) Image generation and processing																
Automated Segmentation of PSMA PET																
1) New methodology & training																
2) Independent testing																
Improved Predictive Modelling																
1) Design and analysis of radiomic features																
2) Advanced machine learning methods																

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6) Outlines each activity by individual with time commitments:

Table 2: Timeline of Proposed Activities and Trainees and Knowledge Users Involved

Aim Deliverables / Activities (KUs)	Trainee Personnel (% efforts)	Year 1				Year 2				Year 3			
		Q 1	Q 2	Q 3	Q 4	Q 5	Q 6	Q 7	Q 8	Q 9	Q 10	Q 11	Q 12
Aim 1: TB-AMR (KUs: Patrick, Crook, Gardy, Schito, Sekirov)													
1.1 Examine CRyPTIC and ReSeqTB data to identify or create suitable ontological terms	MPH student (100%)												
	PDF (20%)												
1.2 Ontology driven data-specs for TB-AMR using GEEM	MPH student (60%)												
	PDF (20%)												
1.3 Map and harmonize database entries to ontological terms	MPH student (80%)												
1.4 Build ontology-aware data collection instruments for TB	MSc student (80%)												
Aim 2: Foodborne-AMR (KUs: Van Domselaar, Hoang, Mulvey)													
2.1 Ontology expansion and curation to describe the complex Foodborne-AMR investigations (due to the complexity, this will be done iteratively with initial results feeding into Aims 2.2 and 2.3)	PDF (40%)												
	curator (100%)												
	MPH (100%)												
2.2 Ontology driven data-specs for Enteric-AMR using GEEM	PDF (50%)												
2.3 Build NLP-based scripts for data extraction and mapping (programmer build the scripts and PDF manually validate the results)	PDF (40%)												
	Programmer (60%)												
2.4 Use NLP to clean-up data for Enterobase + GenomeTrakr	PDF (100%)												
KT Stakeholder F2F meetings (A+C) & Mid-term review (B)				A			B				C		
Aim 3: Analysis Platform Integration (KUs: Van Domselaar)													
3.1 Build and update data processing modules within IRIDA	Programmer (on-going)												
3.2 Construct AMR visualization tool in IRIDA (most effort in last 5 quarters after data from Aim 1 and Aim 2 are cleaned)	Programmer (80%)												
	Curator (50%) as beta-tester												
3.3 Integrate ontology based data-specs into IRIDA	Programmer (20%)												
3.4 Implement ontology driven querying and filtering functions within IRIDA	MSc student (80%)												
	Curator (50%) as beta-tester												

Each color denotes the primary personnel working on the task. Percent Efforts denotes the amount of time the person spend on a given task during the specified time-period so summing across all activities (down the columns) should give close to 100% but < 100% effort/person

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Six Examples of Effective Knowledge Translation Text

1) Provides dissemination examples:

The proposed research has real-world implications for rehab, neurology and neuroscience; knowledge dissemination will intersect these fields. Results will be communicated via manuscripts and conference presentations at local (e.g., GF Strong Research Day), national (e.g., Canada Stroke Congress) and international conferences (e.g., Society for Neuroscience). As we will be among the first to report whether neurobiology after stroke differs by sex, we will report these data in papers and at stroke recovery conferences, targeting those focusing on women's health (e.g., Women's Health Symposium). We will also identify and direct key messages for clinicians and seek opportunities to provide continuing professional development (e.g., professional courses, symposia, university lectures).

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2) Highlights active involvement of NPA in KT:

Results from this study will be disseminated through publications in high impact, open-access journals that focus on movement disorders or brain imaging research, and through presentations at national and international conferences, including both medical and engineering forums. Also, as the PI is a clinician-scientist who actively participates in public education through the BC Parkinson's Society, any changes positively affecting PD management will be disseminated directly to the stakeholders. For instance, we will liaise with groups who are interested in non-pharmacological therapies at Vancouver General Hospital.

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3) Exemplifies lived experiences:

This study will follow MIWA142, and GIPA143 principles. A diverse and inclusive group of women representing Indigenous, African/Caribbean/Black, youth, older women, and others have and will continue to lend their lived experiences to this project. Following the CHIWOS research model, WLWH informed research questions/survey formulation, will conduct the visit 2 surveys, and present findings. We will also strive to follow OCAP144 principles, with Indigenous knowledge users, PRAs, and BCC3 community advisory board members guiding KT content. In addition to classic KT (conference presentations/abstracts/peer-reviewed publications), we will communicate findings and receive feedback from WLWH attending local HIV Service organizations through Sharing Circles and education sessions. We will hold events for care providers, and share KT through our community partners, study website, and twitter @HIV_HEAR_me. Finally, Elwood, Loutfy and Pick will integrate findings in local/national clinical care guidelines.

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4) Exemplifies interdisciplinary research:

Our team crosses boundaries between computer science, microscopy, and cell biology and will train computer science and cell biology graduate students and post-docs in this multi-disciplinary environment. Trainees will play a prominent role in disseminating our findings to discovery and translational cancer researchers, via conferences and peer-reviewed publications, and to the general public via platforms like LSI public talks, and Science in the City, a local life sciences outreach source in Vancouver. These studies will support commercialization of SMLM Network Analysis and enable new mechanistic understandings leading to new diagnostic and therapeutic approaches to better treat potentially terminal breast and other cancers and provide better prognoses for cancer patients.

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5) Discusses how dissemination led to prior diagnostics improvements:

We all present regularly at international scientific meetings to disseminate our research results. My publications have led to improvements in diagnostic tests for overgrowth syndromes, as the Molecular Genetics Lab at BC Children's Hospital now offers EZH2 sequencing to Canadians as a clinical diagnostic test for Weaver syndrome (as international diagnostic labs like Prevention Genetics and GeneDx offer it to their clients). We will publish detailed case reports and/or case series. I maintain the Leiden Open Variant Database for EZH2 and deposit novel variants into ClinVar if this is not done by the referring laboratory. Furthermore, our data on the functional consequences of rare PRC2 variants will be disseminated to diagnostic labs through publication in the scientific literature, such that clinical reports signed out by those labs will be better able to classify rare PRC2 variants.

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6) Exemplifies an iKT approach:

In addition to traditional dissemination of the outcomes of the proposed project through academic conferences and peer-reviewed publications, our team is also taking an integrated knowledge translation (iKT) approach to guide our research activities with the goal of co-creating TBI-informed tools and resources for use in the sector. These activities are fully funded through grants from the Department of Women and Gender Equality and the Max Bell Foundation. In addition, we have presented our preliminary results at provincial and national level IPV advocacy conferences and initiated consultations with 3 provincial government ministries throughout the past year on potential TBI-informed policy changes regarding support for women who have survived IPV. The goal of these iKT efforts is to increase knowledge and awareness of IPV-related TBI and directly inform the supports that are provided in an effort to improve the long-term health and well-being of this underserved population.

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Six Examples of Effective Impact Statement Text

1) Summarizes preliminary data and what problem this project is designed to solve:

This research also has profound implications for treating patients with PD. EVS is a potentially widely available, non-invasive, non-pharmacological treatment. We have already demonstrated that significant advances in lightweight, portable hardware would allow results from this project to be translated into a mobile wireless EEG/stimulation device. In contrast, DBS surgery can only be done in highly specialized centres. For example, in BC, the waiting list for initial consultation is >36months. Therefore, external stimulation devices may improve symptoms in subjects unsuitable for surgery or provide temporary relief while subjects await surgery.

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2) Discusses knowledge gaps and summarizes corresponding project aims:

Within this project, we aim to develop potent, small molecule inhibitors of thymic stromal lymphopoietin (TSLP) signaling– a key inflammatory pathway in the induction and maintenance of atopic dermatitis (AD) and the atopic march. New treatment options for AD are urgently needed and, although anti-TSLP antibodies are currently being promoted, no small molecule inhibitors, which would allow a topical application, have been developed so far. A topical therapy of skin diseases is highly favorable due to the easy accessibility of the skin, reduced risk of side effects and high acceptance rates amongst patients. Hence, building on our preliminary work, we will develop and synthesize highly potent inhibitors of TSLP signaling with ideal physicochemical properties for efficient skin absorption (logP 1-3 and molecular weight ≤ 800 Da) (Aim 1). First, the compounds will be comprehensively evaluated in 2D cell culture and complex skin disease models with regard to efficacy, biocompatibility and skin absorption (Aim 2). The two most promising compounds will then be tested in established mouse models of AD and the atopic march to assess their efficacy to treat or even prevent of atopic diseases (Aim 3).

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3) Outlines how the proposed project will address care gaps:

Anticipated Impact: In 2019 a randomized control trial investigating “early goal direct hemodynamic optimization” (i.e. a MAP target of 85-100mmHg) versus standard management at 65mmHg demonstrated no efficacy of either uniform MAP target for improving outcome in HIBI patients. This trial’s negative result signals the need to move beyond the dogmatic approach of focusing solely on MAP targets in HIBI post-resuscitation management and a shift towards addressing the inherent complexities of HIBI pathophysiology. Our study aims to investigate the underlying pathophysiologic mechanisms of HIBI in patients identified as exhibiting perfusion dependence and diffusion limitation it will provide foundational knowledge that will foster development of future HIBI treatment strategies.

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4) Exemplifies bench-to-bedside research:

My proposed studies will validate the role of PI3Kp110δin intestinal fibrosis associated with SHIP deficiency. We will also interrogate the key cytokines that trigger PI3Kp110δactivation (and SHIP degradation), IL-4 and IL-13, to rigorously define the perturbed biochemical pathway that drives intestinal fibrosis in the context of SHIP deficiency. I believe that our proposed interventions will restore this pathway to normal levels and switch the type 2 inflammatory response from a pathological, pro-fibrotic response to a healthy and productive healing response. Importantly, we will translate our mouse studies into human studies by examining SHIP and PI3Kp110δ activity and effectors in people with CD, who have or are at risk of developing fibrosis, and people, who do not have fibrosis or risk. If people with CD and fibrosis have low SHIP/ high PI3Kp110δactivity, this identifies a potential mechanism for their fibrotic complications that can be targeted. It is very exciting to note that idelalisib (a PI3Kp110δ inhibitor aka GS1101 or CAL-101), is already licensed for use to treat hematological malignancies. Thus, the work that I have proposed, could be rapidly translated into a 'first-in-kind' therapy to target intestinal fibrosis in people with CD.

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5) Discusses clinical applications of proposed project:

The current proposal focuses on subclinical depression and brings together a unique team of experts whose contributions will ensure the success of this highly innovative research program. The proposed research will be the first to identify the neural signatures of the highly clinically-relevant automatic constraints on thought. By focusing on individuals with subclinical depression, this research could help identify the precursor alterations in neurocognitive functioning that place individuals at risk for developing MDD. It therefore has the potential to significantly contribute to improving the health and quality of life of Canadians. The proposed research could also help identify new opportunities for early intervention and prevention. Overall, this research and its clinical applications have a strong potential to improve the wellbeing of Canadians and benefit our society as a whole.

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6) Describes research problem and how preliminary data support the hypothesis:

Pancreatic cancer is one of the most lethal and poorly understood cancers. The proposed research uses a model designed to mimic human KrasG12D-driven pancreatic cancer to the fullest extent possible and seeks to answer questions of fundamental importance for the prevention and treatment of this horrible disease. Specifically, we seek to understand the pathophysiology and molecular mechanisms underlying the strong link between obesity/early type diabetes and pancreatic cancer. We have, for the first time, tested the hypothesis that excess endogenous insulin plays a causal and direct role in pancreatic cancer development. If our work can be replicated by us and others, there will be a paradigm shift providing the rationale for lifestyle interventions or therapeutics with mild insulin suppressing actions for the prevention pancreatic cancer, and perhaps other cancers.

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Three Examples of Effective Priority Announcement Relevance Form Text

1) Relevance text for three different PAs (the maximum allowed), with each tailored to the specific PA:

Patient-Oriented Research: Early-Career Investigator
Our Project Grant submission, examining the optimal treatment strategies for opioid-related cardiac arrest, is directly relevant to Patient-Oriented research. The proposed work is grounded in a patient engagement framework and uses CIHR's iKT framework to guide its activities. We have created an Advisory Group, which includes individuals with lived experience, including as patients and bystanders. These individuals have contributed to the study design, rationale, and initial plans for knowledge translation. This engagement will continue throughout the study period, including interpretation of results and plans for how study findings will be best disseminated to the community.
We anticipate that the proposed research will directly address and impact the urgent and unabated opioid crisis that continues to have a significant impact across Canada and globally. We will develop the largest and most comprehensive opioid-related cardiac arrest dataset in the world to answer critical, life-saving questions that have been grappled with by policymakers, service providers, and others across the globe. Creating this infrastructure will enable us to develop critical new evidence to inform future cardiac arrest guidelines that can be adopted in Canada, the US, and beyond and will improve the outcomes of opioid-related cardiac arrests internationally.
Through our partnerships with those with lived experience, knowledge-users, policymakers, and guideline organizations, our research results have the potential to inform guidelines to optimize treatment for opioid-related cardiac arrest with respect to bystander efforts, professional management, and public policy on public access overdose kits. This will be of critical importance to public health agencies, pre hospital providers, provincial, federal, and international governments, and medical and social organizations. Opioid overdoses are claiming the lives of epidemic numbers of individuals in our communities and we are not sure how to best resuscitate these victims. This work will provide the information that is urgently needed to guide bystanders and paramedics to provide the best possible treatment to these critically ill patients, with the goal of improving survival.

Population and Public Health
Our study is designed to determine the optimal treatments for opioid-related cardiac arrest, as delivered by bystanders and professional responders. Opioid overdoses have reached epidemic proportions, and represent a national and global public health challenge. Our project grant submission is relevant to the Institute of Population and Public Health for a number of reasons. Our study examines different models of healthcare delivery, including that provided by bystanders and professional responders, as well as the potential impact of different treatment strategies on patient outcomes. We will identify methods that cardiac arrest cases can be identified as opioid-related with information available at the scene of the event, which can be used by 9-1-1 operators to instruct bystanders how to intervene. Subjects studied in our project include those from disadvantaged populations, and research such as this project will serve to improve healthcare delivery inequities and outcomes in our society. Finally, we will investigate innovative systems for naloxone access, using geographical optimization models, to identify the benefit and optimal placement of public access overdose kits.

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We anticipate that the proposed research will address and impact the urgent and unabated opioid crisis that continues to have a significant impact across Canada and globally. These data will provide critical new evidence to inform future cardiac arrest guidelines that can be adopted in Canada, the US, and beyond and will improve the outcomes of opioid-related cardiac arrests internationally. Through our partnerships with those with lived experience, knowledge-users, policymakers, and guideline organizations, our research results have the potential to inform guidelines to optimize treatment for opioid-related cardiac arrest with respect to bystander efforts, professional management, and public policy on public access overdose kits. This will be of critical importance to public health agencies, pre hospital providers, provincial, federal, and international governments, and medical and social organizations. Opioid overdoses are claiming the lives of epidemic numbers of individuals in our communities and we are not sure how to best resuscitate these victims. This work will provide the information that is urgently needed to guide bystanders and paramedics to provide the best possible treatment to these critically ill patients, to improve survival.

Health Services and Policy Research
Our study is designed to determine the optimal treatments for opioid-related cardiac arrest, as delivered by bystanders and professional responders. Opioid overdoses have reached epidemic proportions, and represent a national and global public health challenge. There are few patients who require more timely access to high quality appropriate care. Our study examines the integration of emergent interventions across sectors—that of bystanders and professional responders. The best treatment strategies provided by bystanders and professional responders for opioid-related cardiac arrest are unclear. Acknowledging that 4000 Canadians experience a fatal opioid-related cardiac arrest per year, improved evidence-based guidelines are urgently needed.
In this project we will compare different treatment strategies provided by bystanders and professional responders for opioid-related cardiac arrests, in order to identify the optimal interventions. We will identify methods that cardiac arrest cases can be identified as opioid-related with information available at the scene of the event, which can be used by 9-1-1 operators to instruct bystanders how to intervene. Subjects studied in our project include those from disadvantaged populations, and research such as this project will serve to improve healthcare delivery inequities and outcomes. Whereas nearly all previous research into cardiac arrest has focused on those with heart attack related cases, typically affecting men of the 50-60 year old demographic, our research project seeks to improve outcomes for a population with substance use disorders, with the goal of optimal care for all individuals with cardiac arrest.
Finally, we will investigate innovative systems for naloxone access, using geographical optimization models, to identify the benefit and optimal placement of public access overdose kits.
These data will be of critical importance to public health agencies, pre hospital providers, provincial, federal, and international governments, and medical and social organizations. Opioid overdoses are claiming the lives of epidemic numbers of individuals in our communities and we are not sure how to best resuscitate these victims. This work will provide the information that is urgently needed to guide bystanders and paramedics to provide the best possible treatment to these critically ill patients, with the goal of improving survival.

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2) Addresses a single PA:

Epigenetics/epigenomics in human health or disease
Our work shows that antibiotics eliminate butyrate producing bacteria during neonatal life and this leads to a life-long alteration in susceptibility to allergic disease. In this proposal we will investigate this process at the cellular level through single cell RNA sequence analysis of hematopoietic stem cells and immune cell precursors. This could lead to novel insights into how environmental insults lead to life long alterations in immune response which would have a transformative effect on our view of how environmental factors influence a wide variety of disease.

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3) Exemplifies how the project goal is related to the PA:

Neurosciences, Mental Health and Addiction
OVERALL GOAL OF RESEARCH PROGRAM: Whether due to genetics, the aging process, viral infections, drug use, or other insults, disruption of synaptic communication is the leading underlying cause of many brain disorders including intellectual disabilities, schizophrenia, autism, Alzheimer's disease, anxiety disorders and addiction. The overarching goal of my research program is to resolve molecular mechanisms underlying synapse formation and plasticity, and to ascertain how synaptic modifications impact the function of neural circuits as well as cognition and behavior. Our overarching hypothesis is that a full understanding of synapse form and function and how these processes go awry in specific brain disorders is central to the development of treatments. Indeed, we hypothesize that restoring proper synapse function will normalize symptoms associated with neurological or psychiatric diseases. It is important to note that there have been exciting, unexpected successes in reversing in adult animals the effects of mutations causing neurodevelopmental disorders, such as Down and Rett syndromes, highlighting the viability of our research concept.
GOAL OF CURRENT PROPOSAL: In keeping with this concept, the proposed project aims to determine how the palmitoylating enzyme, DHCC9, regulates synapse formation and plasticity in vitro and in vivo, and whether restoring DHHC9function in adult mice can rescue identified phenotypes. We also propose to identify downstream substrates of DHHC9 and to identify synaptic proteins that are differentially palmitoylated by DHHC9 following a learning task.