Comprehensive Research Experience for Medical Students
Summer Research Program 2019

Supervisor/Project Information Form
Due February 20 2019 by email to <u>crems.programs@utoronto.ca</u>

Supervisor Name: Chung-Wai Chow; Geoffrey Liu; Wei Xu

Project Title: Phase 2 Trial of Breathomics for Diagnosis of Pulmonary Disease and Pulmonary Treatment Complications

Hospital/Research Institution: University Health Network (Toronto General Hospital and Princess Margaret Cancer Centre)

Email: Geoffrey.Liu@uhn.ca

Field of Research (2 keywords): Translational Research; Respiratory Oncology

Department: Medicine; Medical Biophysics; Biostatistics; Computational Science

School of Graduate Studies Appointment (IMS, LMP, IHPME etc)? Yes/No: Yes**If YES, please name:** IMS, Epidemiology, Biostatistics, and Environmental Health (Dalla Lana), and Medical Biophysics

Project Title: Phase 2 Trial of Breathomics for Diagnosis of Pulmonary Disease and Pulmonary Treatment Complications

Brief Project Description (<300 words):

Breathomics is the evaluation of volatile organic compounds (VOCs) in the breath. This is a unique opportunity for a serious, budding clinician-scientist to have an interdisciplinary experience that marries biomarker development, novel technology, clinical trials design, statistics and bioinformatics in translational research. Building on recent publications demonstrating the use of the highly-sensitive noses of trained dogs to detect cancer and other diseases, our team is working with a Dutch team to evaluate a point-of-care, rapid, non-invasive, accurate, bioinformatically-informed electronic-nose method to detect these VOCs using metal oxide sensors attached to a spirometric machine (www.breathbase.com). Early results suggest high accuracy to detect and distinguish between lung cancer, COPD, healthy individuals and to identify cancer responders to immune checkpoint inhibitors (with receiver-operator curve area-under-the-curve values of approximately 0.90 for each comparison). The student's study aims are: (a) to assess novel technology in a Phase II trials-setting as part of a biomarker pipeline analysis; (b) to refine the breath signatures that distinguishes between different diseases (interstitial lung disease, COPD, lung cancer) or treatment responses (to antibiotics, anti-neoplastics, immune-modulating drugs); and (c) to develop an implementation strategy and pipeline that will allow this technology to be used in a future Phase III trial. The student will participate in: study design; patient recruitment; data and sample collection; quality control of data; data analysis. Skills that will be developed include: observational and clinical trial design; biomarker pipeline development; analytical and statistical skills; knowledge of different artificial intelligence methods. The student will also participate in a structured lecture/seminar series on research methodology (see www.uhncombiel.com) with other medical undergraduate, undergraduate, post-graduate, and graduate students from medicine, epidemiology,

basic and translational science, statistics, and computational science from the Americas, Europe and Asia. All our past summer CREMS students have presented nationally/internationally with authorship on publications.