Seminar

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“Lung Physiology – We are Beginning to See More Clearly Now, Examples from Asthma to Post-Lung Transplant.”

Thursday, October 31st, 2019 -11:30am
Room 3H1, Tupper Building, 5650 College St.

Abstract:

Developing new technologies can lead to advances in both understanding of diseases, as well as lead to commercialization and ultimately improvement of patient care. I will provide a story how advancing lung function testing technology and combining with novel imaging is providing new data teaching us about asthma and lung transplant pathology and perhaps leading to improved clinical care.

The lung is often referred to as the ‘dark zone’ as it is really challenging to image, especially to see changes in ventilation and lung structure where diseases most often begin in the small airways. Ultrasound doesn’t work, X-ray and CT provide some images, but usually only of gross tissue changes, and standard proton MRI is largely unusable, due to very low tissue density. Now however are available specialized hyperpolarized gas MRI approaches, such as hyperpolarizing He3 or Xe129 that permit detailed examination of ventilation heterogeneity which we are applying to better understand the functional changes that occur in lung disease such as asthma. We are also adapting Single Photon Emission Computed Tomography SPECT/CT to better monitor subjects lung health post-lung transplant. This is important as 50% of patients who receive lung transplant will get a fatal disease known as chronic lung allograft dysfunction but which is poorly detected using current techniques.

I will show how we use these hyperpolarized gas MRI and SPECT/CT techniques coupled with measurements on respiratory system mechanics and computational modelling to better understand lung disease progression and improve disease detection. We observe ventilation dysfunction and heterogeneity using these approaches, and we correlate them to measures of lung functional impairment using oscillometry. Oscillometry is an easy to perform lung function testing method that measures respiratory system mechanics - essentially giving us the information on how hard it is to move air into and out of the lung by using small oscillations of pressure during breathing and measuring the resulting flow. My lab helped develop a version of this method, and I will show how it gives us an idea of how narrow the airways are, and can be used to evaluate the proportion of airways contributing to small airways dysfunction in asthma. Using both imaging and oscillometry, we and others have found that large fractions of the lung can be dysfunctional, which is poorly detected using normal lung function testing. Our more recent finding show that both imaging and oscillometry are sensitive methods to detect lung dysfunction post-lung transplant, and may be providing us new insights into disease pathology.