



AUT INSTITUTE OF BIOMEDICAL TECHNOLOGIES

MODELING THE FORCE-LENGTH DYNAMICS OF AIRWAY SMOOTH MUSCLE

IBTec WISHES TO INVITE YOU TO ATTEND THIS PRESENTATION BY:



PROFESSOR JASON BATES

**Dept. Medicine, Dept. Molecular Physiology & Biophysics
University of Vermont College of Medicine**

Date: Thursday 8 September 2016

Time: 12:00 noon

Venue: WS114, Level 1, WS Building

Airway smooth muscle (ASM) is the effector of the asthma attack, yet it is continually being stretched during breathing. The ability of ASM to generate contractile force while being dynamically stretched is thus a matter of great importance. Much of what is known about the contraction dynamics of skeletal muscle has been translated to the description of ASM, yet there remain crucial differences between the two muscle types. In particular, the structure of skeletal muscle is highly regular and persistent, whereas the structure of ASM is rather amorphous and labile, and indeed the structure of the contractile apparatus in ASM is strongly affected by its state of activation and its length history. Furthermore, ASM is arranged quasi-circumferentially around airways that are consequently narrowed by its contraction whereas skeletal muscle is collinear with the objects it acts upon. Accordingly, the mathematical description of the dynamic force-length behavior of skeletal muscle must be adapted to account for the special characteristics of ASM if it is to account in a reasonable way for the latter. An approach for doing this will be described. It will also be shown that the volume dependence of airways responsiveness can be accurately modeled by incorporating a model of ASM into a computational description of a dynamically contracting airway embedded in elastic lung parenchyma. This leads to insights into the factors that determine airways hyperresponsiveness in asthma.

Bio

Jason H.T. Bates is a respiratory biomedical engineer and physiologist working predominately in the field of lung mechanics with a focus on the biophysical mechanisms of airways responsiveness and the pathophysiology of ventilator-induced lung injury. He is currently a member of the Vermont Lung Center at the University of Vermont (UVM) where he holds the positions of Professor of Medicine and Professor of Molecular Physiology & Biophysics in the UVM College of Medicine. From 2010-14 he also served as Interim Director of the School of Engineering in the UVM College of Engineering & Mathematical Sciences. Dr. Bates is Deputy Editor for the *Journal of Applied Physiology* as well as being on the editorial boards of the *Journal of Clinical Monitoring and Computing* and *Critical Reviews in Biomedical Engineering*. He is also a Fellow of the American Institute for Medical and Biological Engineering (AIMBE) and a Senior member of the Institute of Electrical and Electronic Engineering (IEEE-EMBS).