Modelling contraction and calcium dynamics in airway smooth muscle in the lung

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Asthma is a condition characterized by airway hyper-responsiveness, which results in reversible increases in airway smooth muscle (ASM) contraction, and variable amounts of inflammation of the bronchial mucosa. Hence the understanding of the regulation and mechanics of ASM contraction and the surrounding lung tissue is crucial to medical research. Nowadays, mathematical modeling is an important investigative tool for studying complex biological systems. In our group, we have been constructing a multi-scaled model to improve our understanding of both lung physiology and the development of obstructive lung diseases. The research presented in this talk is particularly contributing to the molecular and cellular levels of modelling.

The contraction of ASM is regulated by the changes in intracellular calcium concentration and the responsiveness of the ASM to this calcium. In this talk, two models are presented: contraction of ASM and calcium dynamics in ASM cells (ASMCs), in context of experimental data. In addition, some predictions we derived from our models are presented and verified through experimental evidence.