Take AIM

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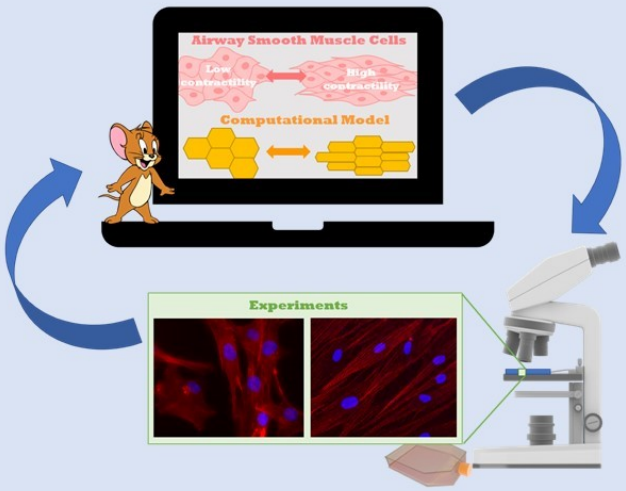

Using Maths to Combat Potentially Fatal Asthma Attacks

TakeAIM Winner 2019:

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Everyone knows someone who has asthma. What most people don't realise is that this disease can be extremely serious and life threatening. 200,000 of UK's asthma patients have a severe form where they don't respond to current treatments and require frequent hospitalisation, thus creating a substantial burden on the NHS and resulting in 3 deaths per day (Asthma UK)! Research into causes of asthma, and the creation of tools that can predict when a fatal attack could occur, or test the effect of new potential therapies, are therefore incredibly important for the quality of life of many asthmatics.

We know there is a large increase in airway smooth muscle mass (the cells which cause the airway to contract) and their underlying extracellular matrix (the network which supports the cells), which substantially (and irreversibly) reduces the diameter of the airway over time. Much of the research into how and why this happens is undertaken using experiments on animals, such as mice. We instead develop a faster, cheaper and more animal-friendly approach which combines computational models and human cell culture experiments, to simulate changes in the structure and biomechanics of airway smooth muscle cells following an asthma attack. Using this approach, we can gain insight into the impact that extracellular matrix structure has on cell shape, alignment and contractility, with the ultimate aim to predict when and why airways might become susceptible to a fatal asthma attack.

The Smith Institute, enabled by the generous sponsorship of our leading corporate partners, ran the TakeAIM competition in 2019 to make visible the crucial role that mathematics will increasingly play in all aspects of our lives. The competition was open to undergraduate and postgraduate students working in the mathematical sciences. First prize was £1,000 of Apple or Amazon vouchers, with second prize winners receiving £200 and 8 runners-up receiving £25 in their choice vouchers.