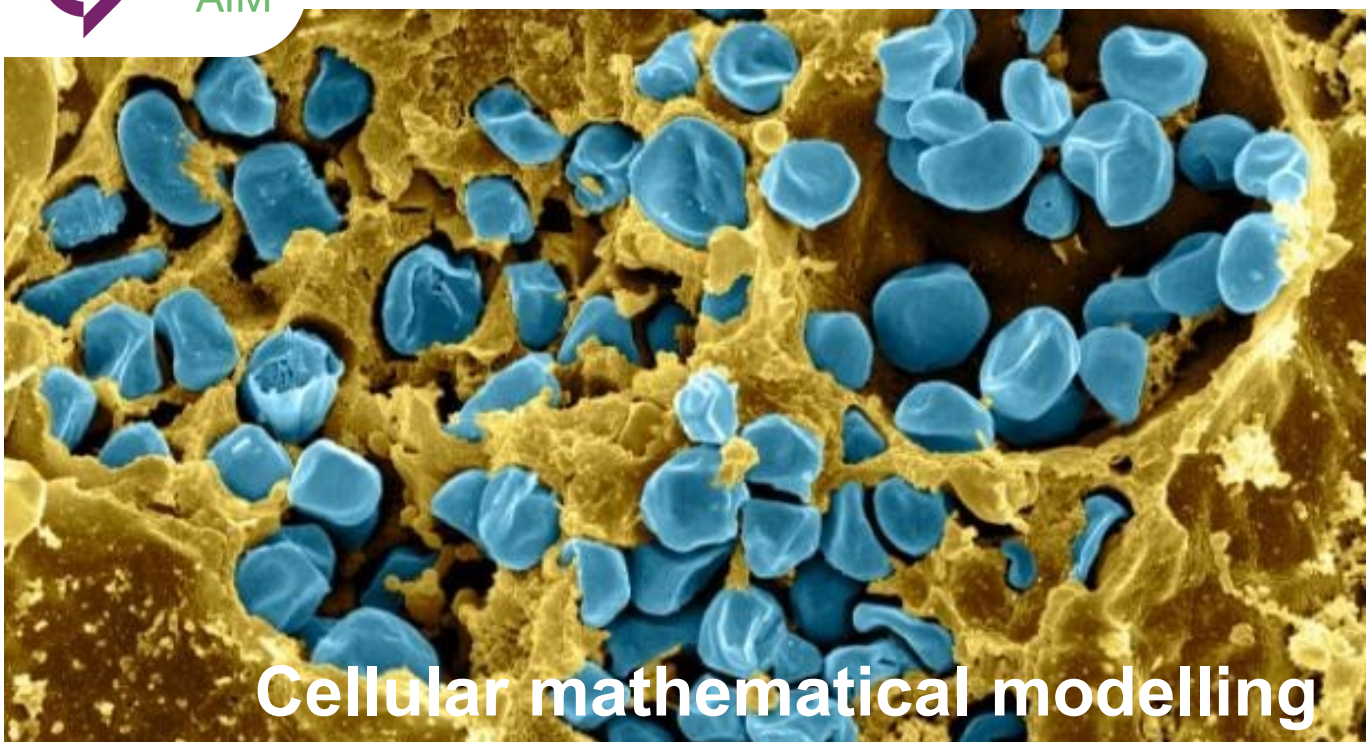

Cellular mathematical modelling

TakeAIM Winner 2018:
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Over the past century advancements in medicine have saved countless lives and one of the key pillars of this achievement is represented by the use of animal models in drug and vaccine testing. These models help scientists select which treatments might be beneficial and which to screen out the potentially harmful ones. Although useful, animal trials are expensive, time-consuming and animal welfare is a constant worry. As a result, finding an alternative would be an important step in optimizing the discovery of more efficient treatments.

My work focuses on designing a cellular model for simulating interactions with pathogens. Given that a important part of a human being's immune system is governed by random motion, stochastic processes are a perfect tool to help model immune reactions. Mathematical models can replace animal models testing by simulating how a certain pathogen interacts with immune cells and offers the possibility of finding where an intervention should take place in order to halt its spreed. Furthermore, by taking advantage of the power of advanced computing these models can reduce the time needed to test a drug compared with animal models. And, of course, mathematical models have the added benefit of not harming innocent animals in the process!

The ubiquity of cellular models means that they can be applied in studying a wide variety of pathogens. I am currently working with DSTL to apply my models to Francisella tularensis, a very dangerous pathogen given its potential to be used in biological terrorism.

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The Smith Institute, enabled by the generous sponsorship of our leading corporate partners, ran the TakeAIM competition in 2018 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 £1,250 of Apple vouchers, with nine runners-up each receiving £100 of Amazon vouchers.