



Modelling Organoid Culture - a New Way to Fight Cancer

TakeAIM 2019 Runner-Up:

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Cancer is a huge health problem in the UK and worldwide, with experts estimating that 1 in 2 people in the UK will develop cancer at some point in their lifetime. Currently only 50% survive cancer for 10 or more years, highlighting the necessity for more effective cancer treatments. It takes an estimated 12 years and £1.15bn to get a drug through clinical trials and onto the pharmacy shelves, with only 5.1% of the cancer drugs entering the first stage of clinical trials being approved for use.

Can we improve preclinical drug screening? Our collaborators, Cellesce, believe they can help. Cellesce are a biotech company specialising in organoid expansion. Organoids are three-dimensional, multi-cellular structures grown in vitro which successfully recreate a realistic in vivo micro-anatomy. Organoids are closer in their tissue structure to organs than alternative research tools, such as animal models, and thus give more relevant results in preclinical drug screens.

Small quantities and batch variability makes the manual organoid growth process unsuitable for large-throughput drug screens. However, the development of suitable culture conditions has allowed Cellesce to utilise bioreactor technology to grow organoids at scale. Our research focuses on modelling their process for organoid expansion, with the goal to improve uniformity and, most importantly, reproducibility of organoids. Mathematical modelling will allow us to gain insights that cannot easily be achieved experimentally. Organoid technology has the potential to revolutionise cancer drug development, thereby improving cancer survival rates.

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.

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