Automated T-cell expansion in an integrated bioelectronics microfluidic chip: paving the way for personalised T-cell therapies for blood cancer

Supervisory team:
Main supervisor: Dr Mirella Di Lorenzo (University of Bath)
Second supervisor: Dr Lucia Marucci (University of Bristol)
Dr Sandhya Moise (University of Bath), Dr Despina Moschou (University of Bath)

Host institution: University of Bath

Project description:
The future of healthcare and advanced therapies will shift toward the delivery of more precise, personalised medicines, where patients are treated as individuals rather than receiving single 'one-size-fits all' treatment. The patient will be at the centre of the healthcare system with tailored solutions that adapt to individual patient needs. Nevertheless, unless novel manufacturing systems are developed, this scientific potential will not be realised. Current manufacturing systems are not suitable for patient-specific healthcare applications, as they are incapable of delivering therapies of sufficient precision and quality. Supervised by an interdisciplinary team of academics, with expertise at the interface of Engineering, Material Science, Life Sciences with Stem Cell Biology, the PhD student carrying out the proposed research will develop an innovative platform for monitoring and controlling, in real time, mammalian cell (specifically T lymphocyte) proliferation and growth. This platform will allow the automation and refining of T cells culture conditions; thanks to an enhanced precision, robustness and control of the process, outcomes of this project could markedly advance the manufacture of cell-based therapies. The project outputs can impact additional fields of research including, but not limited to, biosensing, drug delivery and other stem cell/immunotherapy bioprocesses. At its core, the innovation of this project lies at the interface between multiple disciplines that allows to combine, for the first time, novel biomanufacturing with electronic engineering and mathematics, to develop a T-cell manufacturing platform for robust treatment of chronic, life-threatening and debilitating conditions, such as cancer.