Using Bioengineered Technologies to Develop Novel Therapies for Brain Cancer

Ryan Mathew [1,2], Heiko Wurdak [2]

[1]Department of Neurosurgery, Leeds General Infirmary

[2]Leeds Institute of Cancer and Pathology, University of Leeds

Using primary brain tumour tissue, taken directly at the time of neurosurgery, we reverse engineer cells to become stem cells. These cells have the capability to become any tissue in the body but vitally retain the genetic information that make them cancerous. We can use these new patient-derived cells to form tumour organoids. These organoids or 'mini-tumours' are 3-dimensional, self-organising and self-assembling living structures that mimic early human brain architecture. There is still much work to be done to understand the strengths, weaknesses and nuances of these brain tumour model systems. However, if they can be shown to be sufficiently representative of tumours seen in real patients, the ability to grow them relatively quickly and at scale makes them ideally suited to personalised drug testing. Furthermore, we plan to combine both these stem cell and organoid bioengineering technologies with other advancements such as gene editing (to modulate the tumour driver genes) and microfluidics (to investigate metastases and biomarkers). In the future, it is envisioned that a patient could undergo neurosurgery and then on recovery visit the lab to visualise their own donated tumour tissue re-growing and forming new 'mini-tumours', and being tested with drugs – an investigative and therapeutic approach entirely personalised to the individual patient.