Tissue Engineering and Regenerative Medicine: National and international landscape

• Advanced therapy medicinal products (ATMPs). UK recognised leader in discovery and development.

• Global cell and gene therapy market approx £9 to £14 billion per year by 2025. UK’s market size is estimated at 4% (£0.4 to £0.6 billion)

• In a research sense there is a recognised international society (TERMIS)

• Very interdisciplinary field: research council funding co-ordinated to some degree through the UK Regenerative Medicine Platform (UKRMP)
  • Newcastle represented through Jim Shaw

• Cell and Gene Therapy Catapult established as Innovation Centre of Excellence
Tissue Engineering and Regenerative Medicine:
Current strengths, Newcastle groups

• Cell-based therapy and Tissue Engineering @NCL is well established
  • Arthritis Research UK Tissue Engineering Centre; CELLEUROPE

• Clinical. GvHD (Dickinson); pancreatic islet (J Shaw); corneal stem cell (Figueiredo), IPSC derived retina (Steel), tolerised dendritic cells for RA (Isaacs), mitochondrial disease embryo nuclear transplantation (Turnbull)........

• Basic. Stem cell biology (Lako), Smart biomaterials (Lakey, Ferreira-Duarte, Gentile), tissue templating (Connon), scaffolds and cell printing (Dalgarno, Benning)........

• Delivery of cells/cell survival
  • Storage/transport (tissue/organ storage; shipping of cellular products at hypothermic temperatures) Positioning of cells/Targeted delivery to site of repair
  • Enhanced organ transplant outcomes

• Scalable production of cell/tissues/microtissues/growth factors
  • Bioprocessing of tissue constructs
  • Scaled production of IPS (upscaling)
  • 3D culture
Tissue Engineering and Regenerative Medicine: Future Research Opportunities

• Still a growing field, drive now towards applications for specific conditions

• UK Regenerative Medicine Platform (UKRMP) review of challenge ideas. Call for challenge ideas Oct 2016. Call for new Hub March 2017. Ideas submitted from Newcastle:
  - Delivery – from storage and transport to administration and release of therapeutic cells (Connon)
  - Platform for Organ Replacement Therapy (Shaw)

• Delivery of cells/cell survival

• Microtissues rather than single cell therapy

• Microtissues for screening and theranostics (e.g. Alcyomics)