Regenerative Medicine

Regenerative medicine is an emerging field that approaches the repair or replacement of tissues and organs through manipulation of cells, genes and other biological building blocks, often involving bioengineered materials and technologies. When linked with major advances in the neurosciences and in stem cell research (particularly adult stem cells in tissues previously considered to have limited potential), the future potential for nerve regeneration is enormous. This means that new treatments for those with debilitating neurological conditions are now on the agenda, especially in the areas of Spinal cord damage, Alzheimer's, Parkinson's and Huntington's disease.

The field stretches far beyond the nervous system, to cover questions such as: How do some cells form themselves into the thin tubes of arteries and veins? Why can some organisms regenerate entire limbs? Regenerative medicine specialists are putting breakthroughs in the basic science to work to rebuild blood vessels for heart disease, to recreate skin for burn injuries, to repair the cartilage of slipped discs, and to regenerate the insulin-secreting cells that are sometime lost in diabetes.

Manchester is the home of the UK Tissue Engineering Centre, which specialises in nerve and tissue regeneration, and was created with £10 million funding from the Biotechnology and Biological Sciences Research Council, the largest grant ever awarded by any UK Research Council. This public investment is complemented by a major private grant of £5 million to create the Healing Foundation Centre for Tissue Regeneration, with a particular focus on wound and scar healing. Manchester's expertise in this area has led to a new three-year partnership between Harvard and Manchester, funded by the Gillian and Tony Thornley Foundation and the North American Foundation for the University of Manchester. Research will centre on the molecular genetics underlying wound healing and skin cancer, with a particular focus on keloid scarring, a little understood but extremely common form of lumpy, overgrown scar. It is anticipated that the findings gained in identifying new approaches to the treatment of keloid scars will be highly relevant to an improved understanding of the abnormal growth of cancerous cells at the molecular level.

Manchester is also the home of major expertise in the neurosciences and in stem cell research and houses the North West Embryonic Stem Cell Centre which was funded by £1.45 million from the NW Development Agency together with £500,000 from the MRC.

The University adopts a holistic approach drawing on the various strands of regenerative medicine in its work on neurodegenerative diseases, where its progress continues to be accelerated through philanthropic support (including a recent £2 million bequest to support its cutting-edge work on Parkinson's). This interdisciplinary model is further strengthened through close interactions between Life Sciences and Materials Science to facilitate use of bioengineered materials. One recent example of breakthrough research at the University is the discovery that human eggs which are incapable of becoming viable embryos can be used as a source for stem cells. This move could have major implications into curing illnesses such as Alzheimer's and Parkinson's and could help accelerate the development of regenerative medicine, where there is currently an acute shortage of embryos available for stem cell research.

Manchester has always sought to actively engage in discussion, learning and research into the controversial ethical and moral issues surrounding some aspects of regenerative medicine and stem cell science and the University has recently announced the appointment of Sir John Sulston, the 2002 Nobel Prize winner and pioneer of genomic research. He will chair a new research

institute focusing on the ethical questions raised by science and technology in the 21st century, within the Faculty of Life Sciences.

University of Manchester researchers have recently transformed fat tissue stem cells into nerve cells — and now plan to develop an artificial nerve that will bring damaged limbs and organs back to life. This 'bionic' nerve could also be used in people who have suffered trauma injuries to their limbs or organs, cancer patients whose tumor surgery has affected a nearby nerve trunk and people who have had organ transplants. With a clinical trial on the biomaterial about to be completed, the researchers hope the treatment could be ready for use in four or five years.