



Ulster University

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Ulster University: excellence in capabilities and innovation

Combining its heritage in innovation with capabilities in clinical translational medicine, Ulster University has created a pipeline of promising licensing opportunities that target a number of therapeutic areas.

Ulster University has a history that stretches right back to the 1840s, but it hasn't rested on its laurels. The institution prides itself on innovation, and its capabilities are right up to date. Through Innovation Ulster Ltd (IUL) and the Department for Research and Innovation, the university brings excellence in research and ground-breaking opportunities right to the heart of the worldwide pharma, biotech and healthcare industries.

Excellence in research and facilities

Based across four campuses in Northern Ireland, Ulster University is home to cutting-edge research and has risen to be amongst the top 3% of universities in the world. Its Research Excellence Framework 4-star performance almost doubled between 2008 and 2014, with the biomedical sciences research environment awarded an unprecedented 100% world-leading (4-star). This success is largely down to the Biomedical Sciences Research Institute (BMSRI)¹.

Despite only being founded in October 2004, the BMSRI is ranked in the top 5 of 94 UK universities and is already one of the United Kingdom's leading biomedical research centers. Under the leadership of Tara Moore, professor of personalized medicine, the institute focuses on the prevention, diagnosis and treatment of degenerative and infectious diseases, including cancer, diabetes, heart disease, sight loss, osteoporosis and arthritis, all areas of unmet medical need. This research will increase knowledge on the mechanism of disease and could translate into potential therapeutics through partnerships and collaborations with industry and academia. Moore's research includes techniques that use CRISPR-Cas9 gene editing for the treatment or prevention of corneal dystrophy. She is also involved in the 100,000 Genome Project, focusing on rare eye diseases at the Northern Ireland Genomics Medicine Centre.

Precision medicine is an area of research in which individual variability in genes, environment and lifestyle is taken into account to reliably predict disease and select the best treatment. The Northern Ireland Centre for Stratified Medicine (NICSM), directed by Tony Bjourson, is based at the Clinical Translational Research and Innovation Centre (C-TRIC), which is a partnership between the BMSRI, Altnagelvin Area Hospital and local government. One of its projects is the creation of a Systems Medicine Biobank of patient samples on which whole-genome/transcriptome sequencing is being performed. This will help to identify markers that better inform the treatment of degenerative disease, thus opening the door to precision medicine in a range of inflammatory-related diseases.



Figure 1: The Diabetes Research Group (DRG) at Ulster University with Tara Moore, director of the BMSRI (Biomedical Sciences Research Institute). Back row: Yasser Abdel-Wahab, Stephen McClean, Nigel Irwin, Peter Flatt, Victor Gault. Front row: Aine McKillop, Tara Moore, Neville McClenaghan.

The BMSRI also provides access to state-of-the-art equipment and specialist laboratories and infrastructure through its core facility units, by offering clinical and translational services for industry and academia at good clinical laboratory practice (GCLP) quality-management standards.

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The university's innovation pipeline

Ulster University has a vital and growing pipeline of technologies. Examples of projects that have already had significant global impacts on patients are the world's first portable cardiac defibrillator (spun out as HeartSine Technologies, now Stryker) and the first intelligent, non-invasive, wireless heart monitor (spun out as Intelesens), as well as novel drug delivery platforms and therapeutics (e.g., Sisaf, Jenarron Therapeutics).

The university is constantly feeding new projects into its innovation pipeline from research conducted at its campuses and institutes. The Diabetes Research Group (DRG), led by Peter Flatt (Fig. 1), has established an international reputation in diabetes and obesity drug discovery based on research and development of stable, non-cytotoxic, peptide-based analogues.

The DRG's unique portfolio includes apelin-13, xenin and GIP/xenin hybrid analogues; esculentin, a peptide from *Chirichua leopard frog* skin; spider venom from the Mexican blond tarantula; and dogfish glucagon analogues targeting both glucagon-like peptide 1 (GLP-1) and glucagon receptors. The team has also

identified agonists against a novel G-protein-coupled receptor in pancreatic islets. In advanced animal trials, lead candidates have increased insulin production and sensitivity, lowered levels of blood glucose and lipids, improved glucose tolerance and reduced weight, and appear at least as effective as the blockbuster drugs Victoza (liraglutide) and Byetta (exenatide). A major challenge in preventing and treating diabetes is the lack of biomarkers for early diagnosis, and to monitor the impact of treatment. The DRG has created a pre-diabetes diagnostic assay based on glycosylated insulin, as well as human and rodent insulin-secreting β -cell lines as research tools.

Alzheimer's disease is an area of unmet need that has some surprising crossovers with diabetes, and the NICSM's Neuroscience Research team, led by Paula McClean, is exploiting the university's diabetes know-how in the development of novel Alzheimer's disease-modifying drugs that could potentially stop or even reverse the impact of this distressing and disabling disorder. These include gastric inhibitory polypeptide, GLP-1 and xenin analogues, which can cross the blood-brain barrier, significantly reducing β -amyloid plaque numbers and increasing neuronal growth.

Ulster University is an active collaborator with other universities. John Callan and Tony McHale from the School of Pharmacy and Pharmaceutical Science are working with the University of Oxford to develop a novel pancreatic cancer treatment that uses oxygen-loaded microbubbles to deliver targeted antimetabolite and sonodynamic therapy directly to tumors. This has already resulted in the significant reduction in tumor sizes in preclinical studies.

Licensing and partnering opportunities

Ulster University has an excellent track record of building lasting partnerships and collaborations, and creating successful spin-outs. Its pipeline of innovations is full of potential opportunities for successful collaborations with industry.

1. Ulster University. *Biomedical Sciences Research Institute* <http://biomed.science.ulster.ac.uk/research-institute> (2016).

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