Tarlan ESLAMI

Technology centre: Pharmaceutical Manufacturing Technology Centre (PMTC), NUI Galway
Academic Mentor: Professor Frank Barry
Commercial Partner: Valitacell ltd.
Commercial Mentor: Dr. Jerry Clifford

During Tarlan's veterinary degree she completed 3 phases of study, each lasting 2 years. The first phase involved the study of basic sciences, the second was the pre-clinical phase and the last was the clinical phase. During the final phase she completed her thesis in parallel to her clinical studies. She has worked on her thesis at Stem Cell Techology Research Centre, The thesis centred on the manipulation of stem cells and study the effects of somatic cell nuclear transfer on differentiation capacity.

After completing her thesis Tarlan continued to work at the Stem Cell Technology Research Centre as researcher on projects related to Stem Cells, Emberyology and Tissue Engineering.

Professor Frank Barry

Professor Frank Barry is at the forefront of regenerative medicine in Ireland. His work is centred on the therapeutic application of MSCs, with a specific interest in the treatment of cardiovascular disease (CVD) and osteoarthritis (OA). He has numerous publications investigating diverse aspects of MSC biology, including stem cell differentiation, metabolism, therapeutic mechanism and behaviour. In addition, the Barry laboratory has a keen interest in the development of cell therapy technologies, which recent work and publications on automated platforms for cell therapy production.

Dr. Jerry Clifford

Dr. Jerry Clifford initiated and defined the research programme with the University of Sheffield which led to the development of Valitacell technologies and the associated intellectual property (IP). Dr. Clifford has driven Valitacell's collaborations with both industry and higher education institutes and is responsible for managing the team at both sites, and oversees all aspects of research, development, production, marketing and sales. Prior to establishing Valitacell Dr. Clifford worked as the Commercial Director of Technopath Ltd (2010-2014). The Technopath Group grew significantly during his time there, including achieving a sole supplier contract with a major IVD company. A trade-sale exit of Technopath Distribution to Diploma Healthcare followed in September 2014. Prior to Technopath Jerry was Vice President for Development at the Institute of Technology Tralee. Dr. Clifford trained as neuroscientist and holds a PhD from RCSI and an MBA from UCC.

Pharmaceutical Manufacturing Technology Centre

The Pharmaceutical Manufacturing Technology Centre (PMTC) is a leading industry informed research centre focused on developing advanced technology solutions for all stages of pharmaceutical manufacturing. The market-focused research delivers solutions to contemporary issues currently facing the pharmaceutical industry. The PMTC is hosted at the University of Limerick with core funding from the Irish Government, supplemented with co-funding from industry and leveraging further research funding. Company engagement allows the PMTC to execute world-leading, industry relevant research in advanced technology solutions to address contemporary manufacturing issues across the pharmaceutical sector.

Valitacell

Valitacell Ltd. is an Irish biotechnology company that develops novel technologies to enable faster and cheaper manufacturing of bio-therapeutic drugs. Founded in 2014 and headquartered at the National Institute for Bioprocessing Research and Training (NIBRT), Valitacell is transforming the way next-generation medicines are being produced, so that more patients will have greater access to high-tech drugs. Valitacell products allow users to select cells with greater regulatory confidence at the earliest possible stage during the drug development pathway, to transform the Cell Line Development process with simple and robust technologies. Their core technologies include the Fluorescent Polarisation (FP) platform for rapid product quantification and ChemStress fingerprinting for cellular stability assessment. Having been awarded EU Horizon 2020 SME funding for the advancement and commercialisation of their disruptive 'ChemStress' technology in Chinese Hamster Ovary (CHO) based cell systems, and H2020 FTI funding for the development of intelligent live cell analysis systems, they are now focusing on expanding their technology portfolio into rapidly expanding markets, such as cell therapy and exosome biology.

Tarlan's project

"Mesenchymal stem cell exosome characterisation and high-throughput quantification by fluorescence polarisation spectroscopy"

Stem cells represent a therapeutic approach for the treatment of many diseases as they are able to produce various tissue cell types. Mesenchymal stem cells (MSCs) are one of the most promising candidates among the other stem cell types for cell-based therapies. They can be isolated from bone marrow and adipose tissues aspiration samples in a clinical context.

The therapeutic capacity of cells from different donors varies dramatically and can affect the results of disease treatment directly. Despite the wide knowledge of the different therapeutic features of MSCs, there is no cost-effective and easily applied technique for evaluating their therapeutic characteristics before transplantation. Exosomes are small fluid-filled vesicles produced by all cell types as transporters of biological materials.

Recent studies have demonstrated the role of these extra-cellular secreted vesicles in cell-cell communication. In addition, the biological content of exosomes is reflective of the cell from which they are released and can describe a cells disease status. We hypothesize that exosomes can also reflect the therapeutic quality of the cell from which they originate.

The proposed project will characterise the secreted vesicle populations from different MSC donor cell lines of high and low therapeutic quality. Tarlan will use the current gold standard techniques to isolate and characterise the exosomes. This data will then be used to develop a new assay for the rapid and specific detection of exosomes that can demonstrate the quality of the cells from which they originate. This assay will be simple and robust, with low cost and high accuracy for clinical and industrial use in the MSC therapy and manufacturing fields. Fluorescent Polarization (FP) will be used to quantify the exosomes. The principle of this assay is when free fluorophores (labelled probe) in solution are excited by polarised light, they rotate rapidly and emit depolarised light and when fluorophores are bound/complexed with a larger molecule (target) they rotate at a slower rate and the light retains polarization. This change in polarisation can be used to measure the degree of probe binding, and determine the quantity of exosomes in solution.