

Device for Injection of Biological Materials

The invention introduces an injector to reduce the damage to biological materials such as cells during an injection process and improve the survivability of the biological materials. Cell survivability is a common problem after injections through small bore needles. The injector creates a two layer concentric flow, with the inner fluid being a hydrogel suspension containing cells or biological materials and the outer fluid being a saline solution to minimise the shear rate experienced by the cells suspended in the hydrogel.

Proposed use

The goal of this device is to enable cell therapy with direct injection to be more effective. It can eventually be paired with a multitude of cell therapies, e.g., it will provide a better chance of recovery than just rehabilitation for ischemic stroke patients and its implementation with knee OA stem cell therapy would reduce the medical dependence on total knee replacements.

Problem addressed

Cell injection through a small bore needle remains a challenge due to the high shear rate of the flow, leading to a significant rate of cell mortality. Cell viability rates are as low as 5% after injection. This hinders the effectiveness of cell therapies, in which small bore needles are required to reach many target therapeutic regions. This invention is a novel injection device that reduces mechanical injury that causes cell death and aims to increase efficacy of cell therapies.

Technology overview

The cell injector is developed by a team led by Prof James Moore Jr. This device maximises cell viability by avoiding the mechanical conditions that kill cells going through a small bore needle. Specifically, the syringe is designed to deliver the two fluids in a concentric manner into the needle at a velocity and radial extents such that the cells suspended in the hydrogel are protected from potentially damaging high shear rates.

Intellectual property information

This technology is covered by a patent: WO2022/263797A1 INJECTION DEVICE FOR INJECTION OF BIOLOGICAL MATERIALS.

Inventor information

Prof James Moore Jr, The Bagrit RAEng Chair in Medical Device Design, Faculty of Engineering, Department of Bioengineering. His research interest mainly lies in the biomechanics of the lymphatic and cardiovascular systems He and his teams design medical device technologies based on mathematical modelling and experiments with biological cells, targeting the treatment of diseases including cancer, immunity diseases, heart disease, and stroke.

Benefits

- Predicted to increase acute cell viability to 95%
- Can be paired with cell therapies and improve the efficacy of treatments

Diana Yin

Industry partnerships and
commercialization executive –
Engineering

e: d.yin@imperial.ac.uk

Technology reference: **8873**