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Optimisation and automation of umbilical cord-derived mesenchymal stem cell culture for clinical applications

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Mesenchymal stem cells (MSCs) present a promising potential for regenerative medicine applications because MSCshave the potential to differentiate into lineages of mesoderm origin. Bone marrow is the main source of MSCs, howeveraspirating bone marrow from the donor is invasive, donors are limited, and with increasing age, the proliferative capacity decreases. Umbilical cord (UC) is an excellent alternative source of MSCs because these cells are younger and these cells can be cryopreserved and stored in stem cell bank for the donor and the family. Additionally, this cell has low immunogenicity and can better tolerate HLA mismatch. Following isolation, MSCs will require expansion in vitro to provide sufficient functional biological material for a cell-based therapy. Currently, most stem cell culture processes are conducted at laboratory bench scale by a manual operator. Automation of manual processes will increase standardisation, reduce uncertainty by reducing variability, and ultimately reduce cost. The aim of my research is to optimise andautomate the manual cell culture process of umbilical cord-derived MSCs to prove the potential of such technology for clinical applications. Various culture conditions, including xeno-and serum-free culture conditionshave been investigated to demonstrate the applicability of the completely characterised medium formulation for the production of clinical-grade MSCs.

Biography

Gayatri Ramasamy is currently a third year PhD student working under the supervision of Professor Christopher Hewitt in the Department of Chemical Engineering at Loughborough University. Her thesis focuses on the optimization and automation (CompacTSelecT) of umbilical cordderived mesenchymal stem cell (UC-MSC) culture for clinical applications.She aims to investigate various culture conditions to demonstrate the applicability of better characterised medium formulation for the production of clinical-grade MSCs. In addition to that,she aims to carry out cost comparison studies of the automated and manual UC-MSC production.

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