APPLICATION OF THE MIGRATORY NATURE OF HUMAN MESENCHYMAL STEM CELLS TO OPTIMISE MICROCARRIER-BASED EXPANSION PROCESSES

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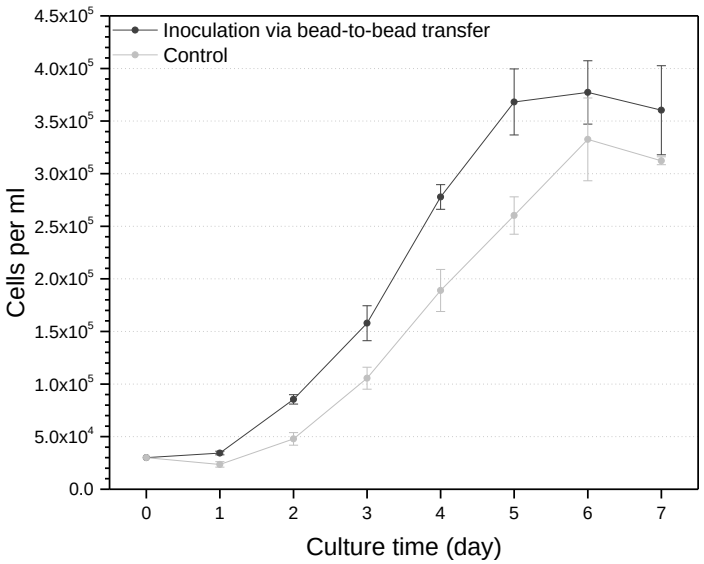
As the number of mesenchymal stem cell based therapies proceeding through clinical trials increases so does the demand for well characterized, scalable expansion technologies that can yield the estimated number of cells required. Microcarriers used in conjunction with stirred tank bioreactors provide a suitable platform for this large scale expansion.

Research has proven that mesenchymal stem cells migrate between microcarriers during culture in agitated systems. A series of experiments have been conducted using Pall SoloHill microcarriers to determine whether this bead-to-bead transfer mechanism can be exploited to streamline various unit operations of the expansion process such as the initial bioreactor inoculation.



Results confirm the feasibility of inoculating a stirred tank bioreactor directly from a cryopreserved working cell bank, then shows how this operation can be improved by attaching the cells to the microcarriers before cryopreservation. This inoculation via bead-to-bead transfer method is shown to reduce the inherent lag phase, enabling the cells to enter the growth phase earlier consequently reducing the overall culture time by 24-hours without negatively affecting cell yield or potency.

These results are an extract from a three-year PhD project, the overall objective of which is to characterise and develop the key unit operations for a microcarrier-based culture process for the expansion of human mesenchymal stem cells. The scope of these selected unit operations encompasses the span of the process, from working cell bank formulation through to the final cell harvest.

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