Cell microfactories: manufacturing cell-based therapeutics [TCES abstract]

Cell microfactories: Manufacturing cell-based therapeutics

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INTRODUCTION: Cell-based therapies may offer solutions for many of the worlds health problems. Early Biotech-led approaches are supporting novel cell and tissue based therapeutics (CATBTs) through biomedical trials. However, their potential benefits are currently curtailed by challenges associated with high cost of goods (COGs) linked to high cell dose requirements which pose availability and manufacturing challenges. Previously we have investigated reducing dose requirements through more effective delivery strategies. Although efficiency can be improved on the delivery side, successful commercialisation of autologous products has remained challenging. To this end, we have developed a cost model examining business strategies for CATBTs with a particular focus on redistributed manufacturing (RDM) to identify those which present the highest probability of success for future business.

METHODS: Human Mesenchymal Stem Cell (hMSC) Culture: Three human bone marrow derived mesenchymal stem cell (hMSCs) lines were cultured for 18 days passaging every 6 days. Culture was performed both manually and in an automated manner with the Compact SELECT platform (TAP Biosystems). Cell counts and viability were obtained using the Nucleocounter NC-3000 automated cell counting system (manual culture) and the Roche Cedex system (automated culture).

Development of the cost model: A detailed cost model was developed using guidance of several key stakeholders in the regenerative medicine field. Input variation caused by biological variability were provided through culture of multiple cell lines known to display a spectrum of growth kinetics. Variation between manual and automated culture conditions were examined using the Compact SELECT automated culture platform. Accurate values for all direct and indirect costs as well as business strategies were supplied through research, quotes or personal communications.

RESULTS: The model created here is based on real cell culture data from both manual operators and automated culture platforms across a range of donor cell lines known to have variable growth kinetics. This provides a robust base on which to extrapolate theoretical cell expansion potentials in various manufacturing scenarios (Fig 1B). this has been further augmented by a range of data on current business practices for not only manufacturing, but delivery, and adoption of therapeutic products. Furthermore, detailed costs and usage patterns for GMP-grade equipment and consumables have been obtained. This has allowed the theoretical costs for various manufacturing scenarios to be calculated over whole production runs

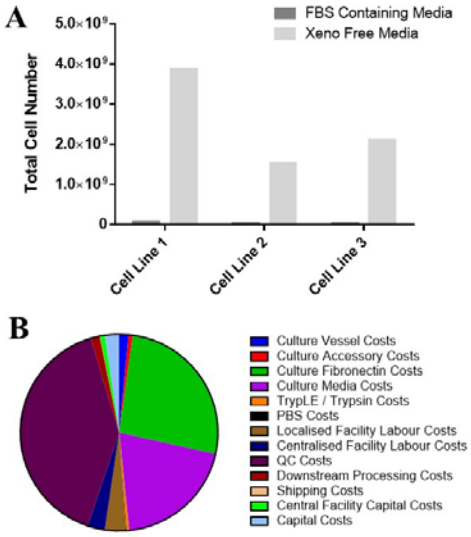

Fig. 1: Predictive data of example CATBT manufacturing obtained through the model. Cells able to be manufactured from various donor patient lines demonstrate considerable difference between lies as well as culture substrates (A). Percentage costs attributable to manufacturing process stages are outlined (B).

DISCUSSION & CONCLUSIONS: A range of different business models were examined for their potential to provide cost-effective and efficacious manufacturing of CATBTs we present a sample of potential data outputs from the model. The overall goal of this model is to provide a tool with which stakeholders in the industry can identify winning business strategies at an early stage, reducing the risk of building large facilities with high sunk capital costs for poor business ventures.