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Bioprocess Microfluidics: The Use of Microfluidic Devices in Bioprocessing

Ang Tsai*

Department of Pediatrics, University of Florida, Gainesville, FL 32603, USA

Introduction

Bioprocessing has long used scale-down approaches to solve scale-up issues. During the early stages of process development, miniaturized bioreactors have thrived as a tool for collecting data that is relevant to the process. Due to the laminar flow's high degree of control over process variables and the potential to cut costs and time, microfluidic devices are an appealing alternative for bioprocessing development. When combined with sensing technology, these devices produce high-quality data that is essential for scale translation and determining the economic viability of bioprocesses. Small molecules, therapeutic proteins, and cellular therapies have all seen the development of microfluidic devices as upstream process development tools. In more recent times, they have also been used to imitate unit operations downstream [1].

Description

The advantages of microcarrier suspension in bioreactors include homogeneous oxygen and nutrition access, real-time on- and off-line monitoring of cells and medium, flexible feeding strategies (such as batch, fed-batch, and perfusion), and an easily scalable vessel design. Clearly, processes like dynamic cell attachment, distinct expansion, and in-situ harvest must be adapted from planar culture methods to microcarrier suspension culture requirements. The Food and Drug Administration (FDA) of the United States has issued a recommendation for the implementation of process analytical technology (PAT) in order to clarify procedures intended to facilitate innovation and risk-based regulatory decisions in development, manufacturing, and quality assurance. It's important to check important process parameters and know how the different processes affect the quality of the finished product. The discontinuous surface, convex curvature, rigidity of the microcarrier, shear stress, collision, and aggregation of the microcarrier, as well as the alteration of hMSC properties and therapeutic potencies resulting from the transition from planar culture to microcarriers have all been the focus of our previous research [2]. Here, we give a complete survey of bioprocessing changes required while assembling hMSCs in microcarrier-based bioreactors. The cycle for huge scope arrangements is likewise examined.

Due to their capacity to repair tissues and reduce inflammation when implanted into a diseased or damaged site, MSCs have piqued a lot of interest in research into the treatment of medical conditions. The efficacy and safety of MSC implantation therapies for tissue repair and disease mitigation through immunomodulation have been demonstrated in numerous clinical trials. Due to the high degree of variability in clinical outcomes, however, many questions remain regarding the therapeutic efficacy of MSCs despite their modest successes. There is unquestionably a need to locate strategies that are capable of consistently achieving success [3]. In addition, MSC therapies face difficulties due to technical considerations regarding the storage and transportation of viable cells and the need to immunologically match donors and recipients to reduce the likelihood of rejection. In addition, it has been discovered that MSCs retain very little within an injury site in many instances. In spite of reports of therapeutic benefits, less than one percent of transplanted MSCs are frequently retained in the target tissue for the long term.

Clostridia rely heavily on carbohydrates as a source of carbon. When the organisms are able to break down complex feedstocks like lignocellulose into fermentable sugars, they can use them directly. For this purpose, cellulolytic clostridia, such as C. thermocellum, produce enzymatic complexes known as cellulosomes, which are discussed in detail elsewhere. Carbohydrates are degraded for energy and reduction equivalent generation when released or directly fed. The oxidative metabolic modules that are in charge of degrading hexoses and pentoses, respectively, are the Embden–Meyerhof–Parnas (EMP) and pentose phosphate pathways (PPP), which are both connected to one another. In the end, pyruvate is made, which can be used to make acetyl-CoA, releasing CO_2 and making more reduction equivalents [4].

Real-time monitoring of various process parameters is necessary for efficient process optimization. By designing, analyzing, and controlling manufacturing through periodic or continuous measurement of critical quality and performance attributes, PAT ensures that the final product meets specifications. Critical quality attributes, or CQAs, are properties that meet specified criteria to guarantee the desired product quality. Process boundaries that influence CQA are called basic cycle boundaries and should be noticed or controlled to guarantee that the interaction prompts the ideal quality. So that PAT can be used to advance continuous cultures, innovation in sensor technology, its configuration, and its robustness are required [5].

The term "EVs" refers to a variety of vesicles that MSCs secrete: exosomes, microvesicles (additionally alluded to as ectosomes), and apoptotic bodies. Exosomes and microvesicles are currently the primary focus of research into the therapeutic potential of EVs. Depicts the origin, size, and distinctive identifying characteristics of each type of vesicle. The International Society for Extracellular Vesicles (ISEV) has suggested using the term "EVs" to cover all EV types because the most common methods for isolating each one aren't able to distinguish between them all.

Conclusion

Macrophage and fibroblast behavior in the context of biomaterial-mediated fibrosis, macrophage-fibroblast crosstalk, and a variety of biomaterial and drug delivery strategies that modulate macrophage and fibroblast behavior to promote tissue regeneration are highlighted in this review. Last but not least, we offer some perspective on the remaining issues and directions that need to be taken in the area of macrophages and fibroblasts in biomaterial-mediated fibrosis.

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***Address for Correspondence:** Ang Tsai, Department of Pediatrics, University of Florida, Gainesville, FL 32603, USA; E-mail: angtsai@umn.edu*

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Conflict of Interest

There are no conflicts of interest by author.

References

1. McDonald, Paul, Benjamin Tran, Christopher R. Williams and Marc Wong, et al. "The rapid identification of elution conditions for therapeutic antibodies from cation-exchange chromatography resins using high-throughput screening." *J Chromatogr A* 1433 (2016): 66-74.
2. McKenzie, Edward A. and W. Mark Abbott. "Expression of recombinant proteins in insect and mammalian cells." *Methods* 147 (2018): 40-49.
3. Meagher, Michael M., Javier G. Seravalli, S. Todd Swanson and Roger G. Ladd, et al. "Process development and cGMP manufacturing of a recombinant ricin vaccine: An effective and stable recombinant ricin a-chain vaccine-RVEc™." *Biotechnology* 27 (2011): 1036-1047.
4. Mehalko, Jennifer L. and Dominic Esposito. "Engineering the transposition-based baculovirus expression vector system for higher efficiency protein production from insect cells." *J Biotech* 238 (2016): 1-8.
5. Ozturk, Sadettin S. "Opportunities and challenges for the implementation of continuous processing in biomanufacturing." *J Pharmaceutical* (2014): 457-478.

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