PERFUSION CELL CULTURE: CHALLENGES AND POTENTIALS BETWEEN LAB AND MANUFACTURING SCALE

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The maturation of biopharmaceutical process understanding and technical advances have paved the way towards the commercial application of continuous bioprocesses. In particular, mammalian cell perfusion cultures have received manifold attention for cell expansion in the N-1 stage or the continuous production in end-to-end biomanufacturing processes. Perfusion processes uniquely offer both optimal cellular and/or consistent product environment. However, their inherent complexity in equipment and operation demands thorough process characterization and development.

In this presentation, development efforts to build on the potential of perfusion processes and challenges during commercial implementation are shared. In a first case study, in depth equipment characterization resulted in a robust and versatile perfusion design[1]. Stable operation and short bioreactor residence time allowed the continuous harvest of the target protein with constant quality characteristics at lab scale[2]. Characteristic times for the adaption of cell metabolism and product quality to the constant operation were revealed. The potential of perfusion cultures to distinctively modulate towards a desired quality profile and benefits of their integration to a continuous downstream cascade are demonstrated[3].

The second part extends on the potential of perfusion to generate an optimal environment for cell growth. Its utilization for the generation of high bioreactor inoculation densities has successfully enabled overall manufacturing process intensification. Challenges of the commercial N-1 perfusion process implementation and associated small scale mitigation strategies are shared.

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