

Comparison of Dynamic Production Processes for Human Mesenchymal Stem Cells

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In cell therapy, human mesenchymal stem cells (hMSC-TERT) are used. For clinical applications, the strictly adherent growing cells must be expanded and harvested in high product quality following GMP- requirements [1-3]. Production processes are a challenge for this very sensitive cell line. As the PAT initiative of the FDA [4] demands an increase of process control and understanding, offline- and online-monitoring of production processes is required to assure final product quality. Static production processes for stem cells are commonly used, but are difficult to monitor and demanding concerning personal and space requirements [5].

At the Institute of Bioprocess Engineering and Pharmaceutical Technology at the University of Applied Sciences Mittelhessen, two GMP-conform dynamic production systems for the expansion and harvest of hMSC-TERT were developed allowing high product quality. A fixed bed reactor with glass beads providing growth surface [1] and process automation will be presented and discussed in comparison to a microcarrier based stirred tank reactor process [6] allowing easier process monitoring.

For both systems, process monitoring according to the PAT initiative is a key issue to assure process control and product quality. The use of dielectric spectroscopy allows the gain of information on cell density, cell adhesion or detachment [7] during the process to define the point of harvest. Data of offline- and online monitoring for both systems will be presented.

Both systems will be discussed concerning system complexity, cell growth, time-space yield, substrates, metabolites as well as process engineering aspects.

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