

Bioreactor systems for cell expansion and differentiation

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“Standard” cell cultivation is still performed under so called static conditions (5% CO₂ at 37°C) incubators in plastic well plates in ambient atmosphere. Static cultures are insufficient to mimic the in vivo conditions, thus cultivations should be performed in a bioreactor where oxygen, pH and the transport of nutrients and metabolic waste in the tissue microenvironment can easily be controlled. For the cultivation of mammalian cells including human stem cells from different sources several bioreactors are already available. These include systems for the expansion and guided differentiation of cells under well controlled and reproducible conditions. The cells within the bioreactors are growing on surfaces and/or biomaterials such as microcarriers or porous structures so that different dynamic systems are used (e.g. stirred tank bioreactors, rocking platforms, perfusion systems, rotating bioreactors). Furthermore many systems have been developed for the applications of biomechanical stimulation e.g. shear stress via fluid flow, strain, compression, torsion. Physiological “training” is of special interest in stem cell differentiation and towards functional 3 D tissues which also includes the cultivation under “hypoxic” (less than 20% oxygen) conditions. Moreover, recently disposable bioreactors and bioprocess strategies for automatization have been developed enabling GMP conform production of cells for cell therapy and tissue engineering applications.

The lecture shall give an update on current research activities within the field of bioreactor developments including the integration of sensors for the production of clinical relevant cell quantity and quality for cell based therapies and tissue engineering applications.

Biography

Cornelia Kasper completed her PhD 1998 from Leibniz University of Hannover (Germany) and her habilitation in 2007 at the Institute for Technical Chemistry at the Leibniz University of Hannover. She was appointed as full university professor for “Biopharmaceutical Production and Technology” at University of Natural Resources and Life Science (BOKU) in Vienna (Austria) at the department of biotechnology. She has published more than 60 papers in reputed journals and several book chapters and is editor within the series “Advances in Biochemical Engineering and Biotechnology” (Springer, 3 volumes already published, 3 more in preparation).

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