Atline microscopic analysis of suspension cell cultures

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Introduction: Atline microscopic analysis and characterization of cells, their morphology, size, integrity and aggregation are essential for monitoring of the cell growth in suspension cultures and qualification of optimal conditions in bioreactors. Applying an automated, portable microscope (1), implemented microfluidic devices, coupled to syringe pumps (2), it is possible to monitor and analyse representative samples of cell suspensions to obtain data for the above-mentioned characteristics. Using microfluidic devices we take advantage of laminar flow, limited observation space and low sample amount to analyse the cells.

Measurement: An appropriate sample volume can be led through a microfluidic device (µ-Slide, Ibidi) and analysed with the atline microscope. For this purpose a high number of images can be produced and analysed automatically using a special software, In-situ Analysis, that identifies objects and object clusters operating with several edge recognition algorithms (3). Obtained data can be related to the analysed image. As shown, the quality of detection depends on flow velocity (4). The measurement can be performed with a required number of images to obtain confirmed results for each sample and provide an insight into a cultivation (5). In this way several characteristics, for example cell form and cell count, can be provided to monitor and improve a cultivation.

Outlook: The atline microscope system can be applied to identify stained cells with several staining dyes to determine viability and to distinguish several cell compartments, such as nuclei (6) and cell membrane. In combination with fluorescence staining certain components and metabolic processes can be detected and analysed. The main aim of this project is an identification of mitochondrial activity.

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