Raman Trapping Microscopy for label-free and fast cell analysis to monitor quality of cells and tissues in Regenerative Medicine

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Abstract (not more than 300 words)

Raman microscopy is an emerging tool in biomedicine. It provides label-free and non-invasive analysis of biological samples. Due to its high biochemical specificity, Raman spectroscopy can be used to acquire spectral fingerprints that allow characterizing cell types and states. Confocal Raman microscopy enables measurements of individual cells in 2D-cell cultures and within 3D-tissues. The integration of simultaneous laser trapping features allows reliable Raman spectra acquisition even of motile bacteria or cells within solution. This combined Raman-Trapping Microscopy (RTM) offers new opportunities in selective biochemical analysis and cell sorting. RTM has the huge advantage that no sample preparation such as staining or labeling is required and that only about 100 cells are enough for meaningful and unfailing results.

Increasingly there is a need to test functionality, integrity and sterility of cell-based products during manufacture and of the final product prior to transplantation. RTM is a novel tool for gentle yet highly precise cell analysis as will be demonstrated in different experiments, providing an overview about the large versatility of this method.

Spectral pattern of bacteria species were established and only 10 measurements of unknown samples were enough to identify the species. The influence of culture conditions on stem cells was measured and we investigated the characteristics of primary human tracheo-bronchial epithelial cells using RTM. Furthermore RTM was used to monitor the quality of skin cells and autologous skin grafts and to proof condition as well as functionality of blood products.

Consequently, Raman microscopy is a promising tool that can be used to analyze single cells and to test the quality of therapeutic cell products. The fast and sample preserving method can provide new insight in biological research and regenerative medicine and has great potential to come standard in quality control of advanced therapeutic medicinal products.

Keywords— Biological relevant spectra evaluation, Label-free cell analysis, Raman spectroscopy, Raman trapping microscopy (RTM)

Professional Biography (100-150 words)



Dr. Karin Schütze studied sports and biology to become a teacher. She focused on bio-photonics and became expert in non-contact cell handling, cell characterization and cell enrichment based on innovative photonic technologies. Together with her husband Raimund Schütze they founded and headed of the former PALM company with emphasis on laser microdissection and catapulting (PALM MicroBeam), that was successfully sold to Carl ZEISS in 2004.

In 2008 they both founded CellTool GmbH that develops and markets innovative Raman trapping microscope systems for label-free and sparing cell analysis. Her expertise is developing complex photonic systems into user friendly easy to handle tools for biomedical applications.

She has more than 80 publications and about 28 patents. Together with her husband they received several awards - such as the Phillip Morris Research Prize (2001), the Berthold Leibinger Innovation price and the nomination for the German Presidents 'Zukunftspreis' (2006).

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Any Comments:

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