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Enhanced real-time digital bright field technology: Lighting the way in bacteriology

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There is a growing interest in rapid and cost-effective technologies for accurate and sensitive detection in microbiology. Previous research has largely been limited to plating methods and optical density (OD) readings which, however, do not allow bacteria visualization. Furthermore, it was shown that spectrophotometers with different optical configurations give different OD values for the same culture. To circumvent such limitations, we developed a robust, automated digital time-lapse bright field imaging system (oCelloScope) enabling higher throughput, non-invasive, real-time monitoring of microbial growth and morphological features using commercial microtiter plates and microscope slides. The oCelloScope consists of a digital camera, an illumination unit and a lens where the optical axis is tilted 6.25° relative to the horizontal plane. Such tilting facilitates the scanning of volumes to record a series of images that form an image stack and enables more freedom of operation at both high and low cell concentrations. When the microorganisms are settled at the bottom of the microwell, all of them are caught in focus along the horizontal plane. The dedicated UniExplorer software allows instrument control and data analysis. The oCelloScope was successfully applied for screening of bacterial mutants based on quantification of morphological features, on-line measurement of bacterial growth and evaluation of bacterial behavior in presence of selective medium, antimicrobial susceptibility testing and determination of minimum inhibitory concentration. As the oCelloScope enables the visualization of low bacterial concentrations, it also facilitates capturing the early stages in microbial growth that could not otherwise be detected with OD.

Biography

Chiara Canali has completed her PhD from Technical University of Denmark, Department of Micro and Nano-technology. Her main expertise covers the development of bioluminescence sensors and electrical impedance sensors with application to biotechnology and biomedical engineering working at University of Bologna, Leiden University Medical Centre, Institut Polytechnique de Grenoble and University of Oslo. She is currently an Application Specialist at Philips BioCell A/S.

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