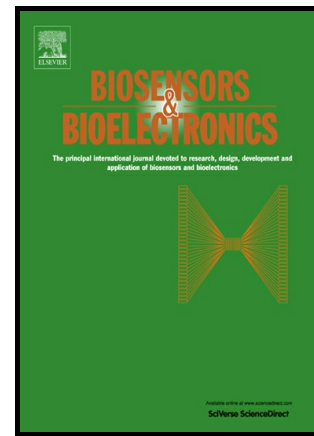


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An approach for cell viability online detection based on the characteristics of lensfree cell diffraction fingerprint

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Abstract

To overcome the drawbacks such as low automation and high cost, an approach for cell viability online detection is proposed, based on the extracted lensfree cell diffraction fingerprint characteristics. The cell fingerprints are acquired by a constructed large field-of-view (FOV) diffraction imaging platform without any lenses. The approach realizes distinguishing live and dead cells online and calculating cell viability index based on the number of live cells. With theoretical analysis and simulation, diffraction fingerprints of cells with different morphology are simulated and two characteristics are discovered to be able to reflect cell viability status effectively. Two parameters, fringe intensity contrast (FIC) and fringe dispersion (FD), are defined to quantify these two characteristics. They are verified to be reliable to identify live cells. In a cytotoxicity assay of different methyl mercury concentration on BRL cells, the proposed approach is used to detect cell viability. MTT method is also employed and the results of correlational analysis and Bland-Altman analysis prove the validity of the proposed approach. By comparison, it can be revealed that the proposed approach has some advantages over other present techniques. Therefore it may be widely used as a cell viability measurement method in drug screening, nutritional investigation and cell toxicology studies.

Keywords: Cell viability; Online detection; Diffraction fingerprint; Lensfree platform; High automation; Low cost.

1. Introduction

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