HIGH-THROUGHPUT AND HIGH-CONTENTS SCREENING OF NANOPARTICLE CYTOTOXICITIES BY USING CELLS-ON-CHIP MICROFLUIDIC DEVICES.

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Engineered nanomaterials with unique physicochemical properties (e.g., small sizes, variable shapes and surface coatings) are recently being extensively used for many industrial applications, such as cosmetics, solar cell and biological/ medical imaging. However, due to the wide variations in their physicochemical properties and lack of appropriate dosing metrics, reasonable assessments of their potential risks and appropriate regulation of these novel materials are recognized as an urgent but difficult task to achieve.

Cells-on-chip microfluidic devices have significant implications in the fields of cell-based cytotoxicity assay as they enable conventional assays to be conducted in high-throughput (HTS) and high-contents screening (HCS) fashion. Here, we present our recent efforts to develop a HTS & HCS cytotoxicity assay strategies for the risk assessments of engineered nanomaterials. Our approach is based on the detection of phenotypic changes, MTT formazan formation and reactive oxygen species (ROS) generation of adherent chang liver cells cultured and exposed to toxins (i.e., nanoparticles) within a microfluidic device (μ-FD). Toxin concentration-dependent absorbance, fluorescence and phenotypic changes were carefully measured, analyzed and quantified, which demonstrated that these μ-FD based assay methods can provide us a simple, easy and efficient ways for the measurement of nanoparticle cytotoxicity, which can be adapted to high-throughput and high-contents screening platform for nanoparticle cytotoxicity assay.