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MASTER THESIS PROJECT

VALIDATION OF AN IN VITRO HIGH THROUGHPUT METHOD FOR THE ASSESSMENT OF CYTOTOXICITY OF NANOMATERIALS

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ABSTRACT

Nanoparticles are widely used in various industries, their potential harmful effects on human health necessitate efficient screening methods. Despite the challenges that the physicochemical characterization of nanoparticles presents, tools to successfully screen nanoparticles for potential toxicity have been underexplored. Understanding how different nanoparticles could affect cell properties such as proliferation, and adhesion in real time could unlock new potential for industries to successfully screen nanoparticles at an early stage of substance development. This study aims to evaluate the efficacy of label-free real-time cell analysis (RTCA), as a high-throughput method for the rapid screening of nanomaterials. The effectiveness of RTCA is compared to conventional MTT cytotoxicity assays. Moreover, the relevance of RTCA is validated by benchmarking it with the regulatory accepted use of 3D reconstructed human epidermis OECD 439 model in assessing the impact of synthetic amorphous silica (SAS) on human health. The findings highlight the reliability of RTCA in providing early warnings of hazards associated with nanomaterials and its potential as a high-throughput alternative to conventional cytotoxicity assays. The 3 SAS used did not show potential for cytotoxicity in the classical cytotoxicity and reconstructed human epidermis. The RTCA could follow the cell behaviour continuously for a short time and long-term effects. RTCA presents cytotoxicity at the highest concentration of SAS tested. Our findings suggest a comparable result between the 3 assays signifying that the RTCA is more sensitive. These highlights showcase that RTCA is a reliable, cost-effective, and high-throughput method for chemical and nanomaterial screening.