

Scientific Paper:

Nanotoxicology, 2012; Early Online, 1 - 11

## **Non-invasive determination of cellular oxygen consumption as novel cytotoxicity assay for nanomaterials**

Andrea Neumeyer<sup>1,4</sup>, Mirko Bukowski<sup>2</sup>, Michael Veith<sup>2</sup>, Claus-Michael Lehr<sup>1,3</sup>, & Nicole Daum<sup>1,3</sup>

<sup>1</sup>Biopharmaceutics and Pharmaceutical Technology, Saarland University, Saarbrücken, Germany

<sup>2</sup>INM – Leibniz Institute for New Materials, Saarbrücken, Germany

<sup>3</sup>Helmholtz Institute for Pharmaceutical Research Saarland, Helmholtz Center for Infection Research, Saarbrücken, Germany

<sup>4</sup>Institute for Bio-and Geosciences, IBG-1: Biotechnology, Forschungszentrum Jülich GmbH, Jülich, Germany

### **Abstract:**

Investigating the safety of nanoparticles is essential for many fields of their applications, in particular for consumer products, food and medicines. The conventional dye and fluorescence-based cytotoxicity assays are limited by the interference of such readouts with nanoparticles. This holds in particular when nanomaterials have been fluorescently labelled for other purposes, for example, confocal microscopy. Moreover, most of these assays are invasive, that is, typically involve irreversible changes or destruction of cells and hence only allowing one endpoint measurement. Therefore, a non-invasive method for the detection of cytotoxicity was developed which is based on the automated online monitoring of the oxygen concentration in solution [SensorDish Reader]. Fluorescently labelled silica nanoparticles with different sizes and surface modification of the cellular behaviour and clarifies that size, time, concentration and surface modification of nanoparticles affect cellular viability.

Key-words: cytotoxicity, silica nanoparticles, SensorDish® Reader, non-invasive assay, Caco-2 cells