

Lecture: nanotoxicology / nanobiotechnology

Lab-on-a-chip: a novel approach to monitor nanotoxicology

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As nanotechnology moves towards widespread commercialization, new technologies are needed to adequately address the potential health impact of nanoparticles. It is uncertain whether the same properties that make engineered nanoparticles attractive in nanomedicine could also prove harmful when interacting with healthy cells. Although the benefits are clearly established and exploited, limited attempts in the evaluation of potential undesirable long-term effects have been made.

Over the past decade, the miniaturization of analytical techniques by means of N/MEMS technology has become a dominant trend in research. As demonstrated in genomics research, microanalytical systems have the ability to provide quantitative data in real-time and with high sensitivity. However, microfluidic biochips are also vital for cell analysis where large numbers of single cells or small numbers of cell populations can be tested inexpensively, at high throughput and in a cellular environment of increased physiological relevance.

We have developed a lab-on-a-chip that is capable of non-invasively monitoring *ex vivo* living cells in the absence of background effects. The cell chip is designed to continuously assess cell viability and morphology changes using embedded contact less dielectric microsensors. The integrated nanofluidics allows for controlled administration of nanoparticles to living mammalian cells adhered to modified/activated chip surfaces that are comparable to biological niches. Consequently, the presented work addresses aspects of chip design, sensor characterization and application to nanotoxicology using a variety of nanoparticles.

Keywords: microfluidic biochip, cell chip