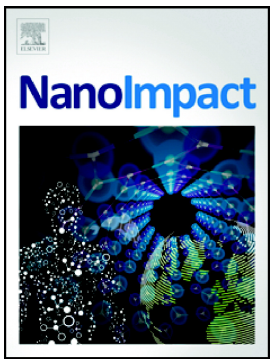

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REVIEW ARTICLE

Refining *in vitro* models for nanomaterial exposure to cells and tissues

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Abstract

With the increasing use of nanomaterials (NMs) in a variety of commercial and medical applications, there is a parallel increase in concern related to unintentional exposure. This leads to a pressing need for appropriate hazard and risk assessment, and subsequent regulation of these new and emerging nanosubstances. Typically, *in vitro* models are the first point for assessment, and these are often then used to begin to predict and translate the potential effects *in* vivo. The area of nanotoxicology is therefore critically important, and requires that experimental protocols are clear, defined and standardized within adequate risk assessment frameworks to allow hazard identification and extrapolation to more realistic *in*