Victoria Sherwood, J Pharm Drug Deliv Res 2017, 6:3 (Suppl)
http://dx.doi.org/10.4172/2325-9604.C1.017

An early developmental vertebrate model to assess nanomaterial safety

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Statement of the Problem: We are developing targeted, drug-loaded nanocarriers for treating the most aggressive forms of skin cancer. These nano formulations are complex multicomponent drug delivery devices, which due to their high surface area-to-volume ratio and complexity in the materials used for construction, have the potential to result in toxicity when administered to patients. Thus, robust safety assessment is a major concern when developing such nontherapeutic agents for the clinic.

Methodology & Theoretical Orientation: We have developed a system to rapidly and robustly assess nanoparticle (NP) safety in the development process of novel nanotherapeutics. This enables us to optimize the NP design and/or synthesis protocol in order to obtain nano therapies that are safe for use in patients. Cell-based assays are the most commonly used approach for nano toxicity assessment, but these methods are known to provide poor *in vitro-in vivo* correlations. We have incorporated an early developmental vertebrate phenotypic screening assay using *Xenopus laevis* as a model organism, into our nano toxicity assessment protocol, to complement the cytotoxicity data. Combining data from these two nano toxicity assessment approaches provides an overall NP hazard assessment index. This index can inform researchers whether or not to progress with further assessment of NP safety in expensive, more labor/time intensive mammalian models, or to first refine the nano formulation.

Findings: Using this approach, we assessed NP safety using a variety of nanomaterials (including formulations developed for biomedical applications). The approach could predict NP safety as confirmed through *in vivo* assessment in mice.

Conclusion & Significance: This work highlights the potential of early developmental models as a rapid screening tool for nanomaterial safety and suggests that such models could be incorporated into routine nano toxicity assessment protocols.

Biography

Victoria Sherwood is a Discovery Fellow in Skin Cancer Biology at University of Dundee. Dundee is ranked number one for biological research in the UK. Her research interests include "Progression of skin tumors into the most dangerous, metastatic forms of the disease and in the development of novel therapeutic strategies to treat these advanced tumors".

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