IN VITRO ASSESSMENT OF EMERGENCY DECONTAMINATION PROCEDURES

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Emergencies that involve the release and exposure of casualties to potentially hazardous chemicals require evidence-based decontamination protocols that can be implemented by first responders soon after exposure. In recent years, researchers have sought to provide a systematic assessment of procedures for responding to emergencies involving hazardous materials[1]. Key to this approach is the evaluation of established protocols, and the development of novel decontamination regimes designed to remove toxic chemicals from both the skin and hair using *in vitro* methods. The outcome of this work will inform a wider evaluation of existing and novel emergency decontamination protocols in human volunteer studies and exercises.

Investigations using *in vitro* diffusion cell models and porcine skin have initially focused on skin decontamination of simulant chemicals that are deemed to be surrogates of known highly toxic materials in terms of their physicochemical properties. Since the OECD test guidelines for dermal absorption[2] identify systemic exposure as the proportion of the test material that has penetrated the skin beyond the *stratum corneum*, this investigation has quantified simulant chemicals in each compartment of the OECD 428 protocol, including the tape-stripped *stratum corneum*[3,4] in order to define what is deemed unabsorbed and absorbed following various decontamination procedures.

The key parameters that have been evaluated to date will be presented at the PPP 2018 meeting. This includes the time between exposure and decontamination, the influence of the vehicle on dermal absorption and the method of decontamination, such as dry wipe, rinse/wipe/rinse and materials used for the different procedures. As the project progresses, a wider range of chemicals and their removal from skin and hair will be evaluated to ensure that any proposed new regime is appropriate for compounds that have different physicochemical properties, a parameter that is known to influence the extent of dermal absorption in both intact and compromised skin[5,6].

1. Kassouf N, Syed S, Larner J, Amlôt R, and Chilcott, RP, Evaluation of absorbent material for use as *ad hoc* dry decontaminants during mass casualty incidents as part of the UK's initial Operational Response (IOR). PLOS ONE, DOI:10.1371/journal.pone.0170966, 2017
2. OECD Test Guideline 428, Skin Absorption: *In Vitro* Method. Organisation for Economic Co-operation and Development, Paris 2004
3. Trebilcock KL, Heylings JR and Wilks MF, *In vitro* tape stripping as a model for *in vivo* skin stripping. Toxicol In Vitro 8 (4) 665-667,1994
4. Davies DJ, Heylings JR, Correa MC, and McCarthy TJ, Development of a compromised skin model *in vitro* using a tape stripping method. Toxicol In Vitro 29, 176-181, 2015
5. Davies DJ, Heylings JR, Gayes H, McCarthy TJ and Mack MC, Further development of an *in vitro* model for studying the penetration of chemicals through compromised skin. Toxicology in Vitro 38, 101-107, 2017
6. Heylings JR, Davies DJ and Burton R, Dermal absorption of testosterone in human and pig skin *in vitro*. Toxicol In Vitro 48, 71-77, 2017

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