Dermatotoxicological and other Safety Testing Methods without Animals - State November 2013

Session 1: Dermatotoxicological risk assessment without animal testing

In-vitro-Testing of Nanomaterials

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A growing exposure to nanomaterials either intended (e.g. drugs, cosmetics) or accidentally (e.g. environmental compounds, workplace exposure) asks for hazard analysis taking the important uptake pathways – gut, lung, skin – into consideration. Yet, the influence of damages and diseases on uptake of the nanomaterials has been neglected for long. With respect to the skin, nanomaterials allow to improve the notoriously poor drug penetration to the site of disease.

Ethics and legislation ask for non-animal testing, several OECD adopted in vitro protocols for endpoints of cutaneous toxicity are established. These protocols, however, are not validated for the testing of nanomaterials. Nanoparticles widely vary in size, lipophilicity/hydrophilicity, surface polarity, rigidity and aggregate formation. These properties influence particles´ cytotoxicity and the penetration into the skin. Moreover, nanoparticles can form a protein corona when making contact with biological fluids. Major progress in biotechnology allows the development of disease models based on reconstructed human skin. The constructs can be used for penetration testing of nanomaterials. The presentation focusses on the evaluation of surface-coated dendrimers, core-multishell nanotransporters and mPEG-coated polyglycerols.

Most advanced nanoparticles are developed, characterized and optimized for drug delivery in skin diseases. Joining regional forces the Collaborative Research Centre 1112 will allow to set-up a broad test-platform for the in-depth characterization of the nanoparticles including safety/toxicity and the interaction with normal and diseased human skin by e.g. human cell-based disease models.