Stem cell-based *in vitro* models: state-of-the-art tools to predict drug-induced tissue injury in humans

Prof. Dr. Joery De Kock, Department of In Vitro Toxicology and Dermato-Cosmetology, VUB

The fact that the detection of drug toxicity is often not accurate and frequently occurs only late during the drug development process is of major concern for the pharmaceutical industry and jeopardizes the potential marketing of new chemical entities. Besides affecting human health, this also leads to a significant loss of resources and time for the pharmaceutical industry. One of the major reasons for this failure is that the safety of new potential drugs is still evaluated in animals or animal-based cell lines. However, efforts at improving the predictability of drug-induced tissue injury in humans are rising due to the rapidly advancing field of human stem cell research. Human target cells for screening and assessment of adverse drug effects in humans can now be generated using pluripotent and multipotent stem cells as detailed in vitro differentiation protocols are established for almost all cell (sub) types. The introduction of state-of-the-art gene editing tools such as CRISPR/Cas9 in stem cell research provides a technology platform to mimic specific genetic polymorphisms or diseases in a dish. In addition, stem cell-based in vitro models can be used to evaluate adverse drug effects during the differentiation process thereby mimicking human developmental toxicity. The latter provides a major advantage over any other non- stem cell-based model. Ultimately, it will be possible to develop personalized toxicology to determine inter-individual susceptibility to adverse drug reactions at any stage of development and in health and disease.