

Utrecht-Advanced In Vitro Models: development of a kidney-on-a-chip for drug screenings

Prof. dr. Roos Masereeuw, Utrecht Institute for Pharmaceutical Sciences, div. Pharmacology, Utrecht University, the Netherlands

Utrecht Advanced In vitro Models (U-AIM) Hub assembles excellent researchers from different disciplines and organizations to work on the challenge to reduce animal experimentation by scientific breakthroughs on the implementation of advanced *in vitro* models within the framework of Utrecht Life Sciences and related disciplines. One of its developments concerns a kidney-on-a-chip platform that should be applicable in drug development and allow for toxicity screenings. Adverse effects caused by exposure to drugs often involve the kidney. Early prediction of those effects, such as drug-drug interactions and renal toxicity, is imperative for the development of new and safe drugs by the pharmaceutical industry. Current *in vitro* assays do not accurately allow such prediction, predominantly due to inadequate preservation of the organs' microenvironment. The kidney epithelium is highly polarized and the maintenance of this polarity is critical for optimal functioning and responsiveness to environmental signals. Cell polarity is dependent on communication between cells, which includes paracrine and autocrine signals, as well as biomechanic and chemotactic processes influencing cell proliferation, migration and differentiation. For drug disposition studies, this microenvironment can be essential in predicting drug transport and metabolism under physiological and pathological conditions. This presentation will provide an overview of advances in 3D cultures of human renal cells in microfluidics. These kidney-on-a-chip platforms provide novel alternative strategies for prediction of renal drug disposition and safety assessment with human-specific models, and may lead to a reduction in animals used for nephrotoxicity testing.