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PIONEERING IPS CELL APPLICATIONS FOR SAFETY AND TOXICITY

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Induced pluripotent stem cells (iPSCs) emerged as the model of choice for cardiovascular risk assessment, and for neuro- and hepatotoxicity screening in-vitro assays. Here, we report on optimized assays based on three different technologies.

1. We implemented a hybrid screening method that combines impedance (cell contractility) with MEA-like extracellular field potential (EFP) into routine screening of iPSC cardiomyocytes. Combined, this assay provides a non-invasive, label-free, high temporal resolution approach for screening iPSC derived cardiomyocytes. Furthermore, we present a new hepatotox screening assay on the impedance-based technology.
2. We developed miniaturized, modular patch clamp devices with full integration in automated robotic platforms, which enables parallel ion channel screening with a chip-based approach in the industry standard microtiter plate format. By drastically minimizing the total cell number required to execute the assays, we adopted our automated patch clamp instruments to iPSC-derived cells such as cardiomyocytes or neurons.
3. By using optogenetics combined with a MEA-based system, we present an in vitro assay with sensitive and multiple readouts for neurotox assays. The system allows as well to study iPSC-based neuronal disease models due to the high throughput, ultra-high resolution (millisecond events with microvolt amplitudes), high electrode count (allows population network activity measurements) and accuracy.