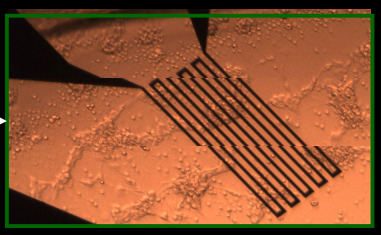
Modular Glass Chip System for the Acquisition of the Electric Activity and Physiological Parameters of Differentiated Stem Cells

The EU chemical policy REACH, effective on June 2007, regulates the registration, evaluation and authorization of chemicals. Investigations on the effects of neurotoxic and developmental-neurotoxic substances are required by European and US-American test guidelines. However, at the moment these tests are based on animal experiments contradicting society claims to abolish animal experiments and to implement the 3R-principle. The resulting problem is…

How to pair REACH and the 3Rs?

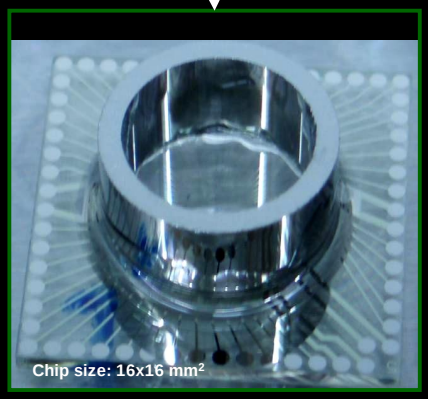
The acquisition board of the modular glass chip system MOGS

We developed a chip system that combines a highly sensitive data acquisition with the use of stem cells to reduce animal experiments.



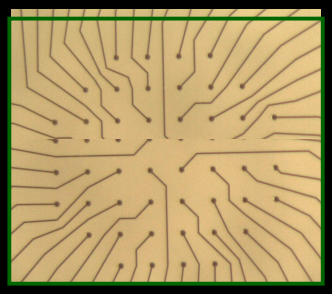
Electrically active cells differentiated from embryonic mouse stem cells (growing on the temperature sensor)

MOGS measures electrical signals of nerve or heart muscle cells and comprises metabolic sensors. So far, it is possible to measure cell adhesion (cell vitality) and chip temperature. The chip allows for parallel high content drug screening (HCS) in clinical research.



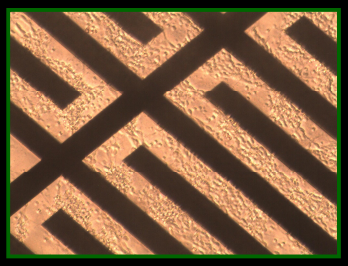
The glass chip – the Heart of MOGS

MOGS is unique in its compactness and fulfills the requirements of REACH and HCS applications. MOGS is a valuable tool for producers of pharmaceuticals as well as bioanalytics. The stem cell technology is used in agreement with the German legislation (StZG).



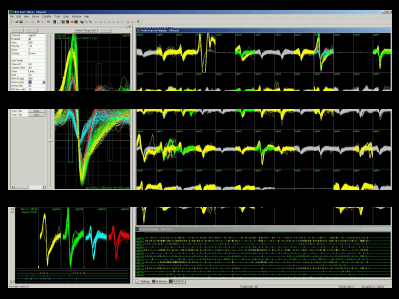
Microelectrode array

Our partner ZEBET (Federal Institute for Risk Assessment, BfR) supports us with stem cells for the measurements with MOGS. ZEBET exhibits an analytical expertise since many years. To receive further certifying and recommendations (by e.g. ECVAM and US-EPA), MOGS has to be tested by Clinical Research Organizations (CROs).

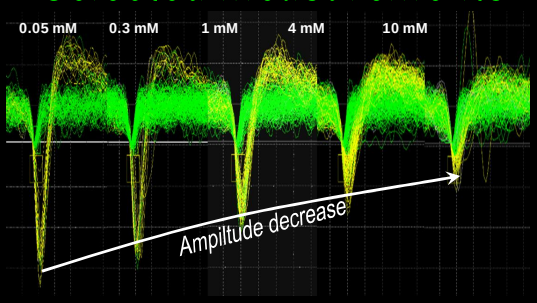


Cell adhesion sensor

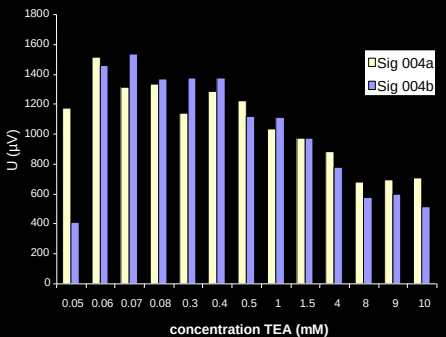
Selected measurements



Screen-shot of action potentials and spike trains without toxic impact.



Signature of decreasing neuronal action potentials (yellow) and noise (green) under the influence of tetraethylene ammonium (TEA). TEA blocks specific membrane channels. Concentrations as indicated.



Voltage decrease of registered action potentials under the influence of increasing concentration of TEA.

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