Functional Synthetic Human Neural Circuits

Initiative: Freigeist-Fellowships

Bewilligung: 30.03.2014

Laufzeit: 5 Jahre

Projekt-Website: https://www.ukbonn.de/ag-busskamp/

In order to understand how parts of the human brain function in health and disease, the aim of this project is to reverse engineer functional human neuronal circuits by combining neuroscience with stem cell research and bioengineering. The human brain is an extremely sophisticated biological computer - by far the most complex biological system in this universe - and our understanding of brain function is still in its infancy. Limited access to human brain tissues for research purposes has also hindered our understanding. To overcome these hurdles, a new constructive approach will be explored. The goal is to generate the basic parts, namely electrically active neurons, from adult human stem cells and to connect these cells in a controlled and reproducible way into defined functional neuronal circuits in vitro. Disease-causing mutations will be introduced to some circuit members trying to model brain diseases in a human setting to explore novel therapeutic interventions. Furthermore, from an engineering point of view, it is aimed to create biological computers using living cells to compute signals as our brain does with extreme efficiency.

Projektbeteiligte

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Open Access-Publikationen

Functional Maturation of Human Stem Cell-Derived Neurons in Long-Term Cultures.
On-demand optogenetic activation of human stem-cell-derived neurons.
Combined experimental and system-level analyses reveal the complex regulatory network of miR-124 during human neurogenesis
A comprehensive library of human transcription factors for cell fate engineering
Long-term morphological and functional dynamics of human stem cell-derived neuronal networks on high-density micro-electrode arrays

Es werden die Institutionen genannt, an denen das Vorhaben durchgeführt wurde, und nicht die aktuelle Adresse.

06.05.2024

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