

Research Student Project /Master Student Project

Role of reactive astrogliosis in secondary neurodegeneration after ischemic stroke

Background

Astrocytes have many functions in the CNS, including control of neuronal synapses, neural plasticity and regeneration processes. In situations such as stroke or neurodegenerative diseases, astrocytes become reactive (Pekny et al., 2016). Upregulation of the part of the cytoskeleton known as nanofilaments (intermediate filaments), which are composed of GFAP and vimentin, are the hallmark of astrocyte reactivity. Our German-Swedish collaborative consortium (Prof. Dr. Mathias Hoehn, Dr. Markus Aswendt in Cologne, Germany and Prof. Dr. Milos Pekny, Prof. Dr. Marcela Pekna at Gothenburg University, Sweden) has most recently discovered that stroke-induced reactive astrogliosis plays an important role in post-stroke neuronal connectivity (Aswendt et al. 2022).

In this project, we will apply the state-of-the-art high resolution MRI technology, which was previously developed in the research laboratory of Prof. Dr. Mathias Hoehn and Dr. Markus Aswendt, to address the role of reactive astrogliosis in stroke-induced secondary neurodegeneration. Secondary neurodegeneration in the thalamus is a pathological response responsible for severe and long-lasting neurological impairment in many stroke survivors.

Project outline

This project will use mice devoid of GFAP and vimentin, which exhibit attenuated reactive astrogliosis. We will induce cortical stroke by photothrombosis and assess sensorimotor functions by established behavior tests. To quantify degeneration of sensorimotor fiber tracts, secondary neurodegeneration in the thalamus, and changes in the functional network, we will perform T2-weighted MRI, diffusion tensor imaging (DTI), and resting-state fMRI (Aswendt et al. 2021 and 2022). The data will be analyzed using our atlas-based imaging pipeline AIDAmri (Pallast et al. 2019).

We are looking for a highly motivated research student ready to work in Cologne, with a strong interest in experimental stroke research and state-of-the-art MRI imaging technologies.

Please send your motivation letter and CV to Dr. Markus Aswendt, University Hospital Cologne, Dept. of Neurology - Markus.Aswendt@uk-koeln.de
You are also welcome to contact Prof. Milos Pekny at Milos.Pekny@neuro.gu.se or Prof. Marcela Pekna at Marcela.Pekna@neuro.gu.se for more information about the project.

References

- Pekny et al., Acta Neuropathol., 131: 323-45 (2016)
- Aswendt et al., Prog Neurobiol, 209: 102199 (2022)
- Aswendt et al., Transl. Stroke Res, 12: 87-97 (2021)
- Pallast et al., Front Neuroinform, 13:42 (2019)