Experimental Master Thesis Project

Start ASAP

Clinic for Anesthesiology and Intensive Care, School of Medicine and Health, TUM, Research Group Fenzl "Neurobiology Sleep and Anesthesia"

https://anaesthesie.mri.tum.de/de/forschung/wissenschaftliche-arbeitsgruppen/neurobiology-sleep-and-anesthesiology

https://www.gsn.uni-muenchen.de/people/faculty/associate/fenzl/index.html

In this project for a master thesis, we aim to explore the role of γ-aminobutyric acid (GABA) Type A receptors ($GABA_A$-Rs) featuring the α4-subunit (encoded by the *gabra4* gene) in the neuropharmacological actions of common anesthetics in mice, particularly focusing on the processes of anesthesia induction, emergence, and the modulation of sleep behavior both at baseline and post-anesthesia. $GABA_A$-Rs with the α4-subunit are primarily located extrasynaptically in key brain regions such as the cortex, thalamus, and hippocampus. Previous ex-vivo brain slice electrophysiology studies indicate that these receptors facilitate a unique form of tonic inhibition, specifically enhanced by subanesthetic concentrations. This suggests that they may play a significant role in mediating state transitions during anesthesia and – due to important mechanistical overlap – sleep.

While the molecular and cellular interactions of anesthetics with these receptors are well-documented, this project seeks to understand their network effects and broader implications during anesthesia. Additionally, pre- and postanesthetic sleep behavior with its complex state transitions and reliance on inhibitory networks, is also a major area of the present study.

We employ chronically implanted, epidural EEG setups to monitor freely behaving mice, including both wild-type and gabra4 knock-out models. The study focuses on evaluating baseline and post-anesthesia sleep behaviors, alongside electroencephalographic changes during anesthesia. Trainees will gain hands-on experience in animal handling, microsurgical implantation of EEG setups with contemporary intraoperative vital monitoring, chronic EEG recording, and brain preservation and processing techniques like immunostaining. Additionally, the project includes advanced EEG-biosignal analysis, covering spectral and temporal features, FOOOF, entropy, and processed index parameters.

Contact: **Thomas Fenzl**

thomas.fenzl@tum.de

089 4140 9043