

Research Project

Name of Institution and department:

Department of Neuroradiology; Universityhospital Freiburg

Link to website: [https://www.uniklinik-](https://www.uniklinik-freiburg.de/neuroradiologie/forschung/multimodale-biomarker-fuer-neurodegeneration.html)

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City and Country of Institution: Freiburg, Germany

RESEARCH GROUP

The proposed research will be carried out within the research group *Multimodal Biomarkers of Neurodegeneration*. Our research group focusses on a profound understanding of the pathophysiology and a precise diagnosis as this is necessary for targeted therapeutic measures. Modern biomarkers can make an essential contribution to this, but must be developed and validated before we can establish them in clinical routine.

TITLE OF PROPOSED RESEARCH PROJECT

Multiparametric assessment of limbic system integrity in healthy ageing, epilepsy, and neurodegeneration

OBJECTIVES

- To develop and validate a multimodal MRI-based biomarker for assessing limbic system integrity.
- This will rely on both qualitative (3D FLAIR, 3D T1-weighted MPRAGE) and quantitative (quantitative T1 mapping, multishell diffusion imaging, ASL) analyses in limbic regions (e.g. hippocampus, amygdala, entorhinal cortex).
- To compare these imaging parameters across healthy controls, patients with epilepsy (e.g. temporal lobe epilepsy, MRI-negative epilepsy), and neurodegenerative cohorts (Alzheimer's and Parkinson's disease) and evaluate their diagnostic and prognostic value and association with clinical symptoms.

APPLICANT'S DUTIES

- Perform visual inspection and quality control of raw MRI data and outputs from processing pipelines (CAT12, FreeSurfer, DMI, NODDI, DTI, BASIL).
- Execute image processing workflows: brain segmentation, region-of-interest extraction, and parametric mapping.
- Conduct statistical analyses and group comparisons using general linear models and mixed-effects approaches.
- Contribute to preparation of abstracts, conference presentations, and manuscript drafting.

APPLICANT'S BENEFITS

- Co-authorship on project-related conference presentations and peer-reviewed publications.
 - Hands-on training in advanced MRI post-processing techniques and biomarker development.
 - Participation in ESOR training workshops, neuroradiology seminars, and interdisciplinary research colloquia.
 - Access to high-performance computing resources and institutional imaging datasets.
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- Project Leader: Prof. Dr. med. Horst Urbach, MD & Dr. med. Alexander Rau, MD
 - Members: Dr. med. Nils Schröter, MD; Araz Incesoy; Marco Reisert, PhD