UNIKLINIK KÖLN | Institut für Humangenetik

CMMC CENTER FOR MOLECULAR MEDICINE COLOGNE

The Institute of Human Genetics (University Hospital Cologne) / CMMC is seeking applications for

# MSc Student or MD candidate (f/m/d)

ready to start at any time, applications are welcome until positions are filled.

We are searching for students interested in the area of

## Neurodegeneration, Alzheimer's disease and related tauopathies, neurogenetic disease, and basic cellular neurobiology

to join the laboratory "Functional Genetics of Neurodegeneration and Neurologic Disorders" under the lead of Hans Zempel, MD PhD MSc, with currently 1 technician, 1 post-doc, 4 PhD students, and 1-2 undergraduate students. The group is embedded in the Institute of Human Genetics (University Hospital Cologne), with roughly 50 scientists and medical doctors, joint progress reports and journal clubs together with collaborating neuroscience groups from adjacent research institutions.

The applied methods in our laboratory comprise (but are not limited to) state of the art cellular neurobiology / cell biology, molecular biology / advanced genetic engineering, biochemistry, and advanced microscopy. Applicants should be enthusiastic about understanding basic disease pathomechanisms to help find treatments for currently incurable diseases. For a brief overview of current projects, see:
https://humangenetik.uk-koeln.de/en/research/functional-genetics-of-neurodegeneration-and-neurological-disorders-working-group/.
https://www.cmmc-uni-koeln.de/research/career-advancement-groups/

**Your profile**

- **Master student** in Biology, Biochemistry, Cellular Neuroscience or related disciplines or **medical student** with 6 - 12 months of lab time
- High level of intrinsic motivation and reliability
- Collaborative work attitude and flexibility
- Experience in microscopy and cell culture work is highly favoured, but not strictly necessary
- Good oral and written communication skills in English

**Our offer**

- A highly motivated international team of young researchers associated with and located in the CMMC, the University Hospital Cologne and the University of Cologne.
- Close contact to principle investigators and research groups of the above mentioned institutes
- Fast integration to an open-minded and welcoming group
- Supervised training in performing advanced laboratory work, scientific writing for publications and grants, and scientific presentations

**The applicant is supposed to work on the following projects:**

The microtubule-associated protein Tau is a key driver of the neurodegeneration observed in Alzheimer's disease (AD) and other types of dementia. Besides its role in disease pathogenesis, Tau stabilizes neuronal microtubules and likely promotes essential functions, such as axonal growth, transport, synapse formation, and neuronal activity. Alternative splicing of the gene encoding for TAU, *MAPT*, results in the expression of six isoforms in the human brain that differ in their intracellular localization. Most models of AD and Tau pathology are based on rodents, which express a different set of Tau isoforms. Focusing on human cellular and neuronal models is crucial for understanding the mechanisms behind disease pathology and validating that the proposed functions of Tau are not limited to the model system used. Until today, there is no cure for these detrimental disorders, which represent a great burden for those affected, their relatives, and society.

**Possible project description: Investigation of the AIS as a driver of intracellular Tau sorting mechanisms**

The Tau protein is mainly sorted to the axonal compartment in healthy brain neurons. We aim to unravel the mechanisms that are responsible for efficient Tau sorting under physiological conditions, as this is a prerequisite for understanding the development of pathological Tau missorting. We focus on both protein-intrinsic components and cellular interactors that may contribute to the axonal localization of Tau. During the project's duration, the student would collaborate with an experienced PhD student to forward this project.

The primary cell model used for the project are human induced pluripotent stem cell (hiPSC)-derived glutamatergic neurons. We use either transfection or lentiviral transduction to introduce self-engineered plasmids to the neuronal cultures. Besides plasmid introduction, the cell culture work includes e.g. maintenance tasks like seeding and passaging of hiPSCs, related time course experiments or stressor titrations, and protein harvesting. Downstream analysis approaches include advanced fluorescence microscopy, western blots and qPCR. The focus of the study will be the establishment of a model for Tau sorting using live-cell fluorescence microscopy of iPSC-derived cortical neurons.

For other running/possible projects (e.g. neurogenetic disease, neuronal cell polarity, micro-tubule dynamics/MARK, others) see above mentioned homepages, suggestions also welcome.

**Further information & Contact**

Application deadline: None. The positions are advertised until they are filled.

Candidates should submit a single PDF including a brief motivational letter (max. 1 page), curriculum vitae, academic transcripts and a description of previous research experience.

Please send your application as one single, compressed PDF-file to:
**hans.zempel@uk-koeln.de** and **dadam@smail.uni-koeln.de**