# Master thesis project: Human liver sinusoidal endothelial cells in liver disease (m/f/d)

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We are seeking a motivated Master's student to join our interdisciplinary research team investigating the role of liver sinusoidal endothelial cells (LSECs) in chronic liver diseases, including cirrhosis. The anticipated duration is 9-12 months.

## The project

LSECs form the specialized vascular interface of the liver and are among the first cells to sense changes in the circulating environment. During chronic liver disease, LSECs undergo profound functional and molecular alterations, including loss of their characteristic sinusoidal phenotype, altered barrier properties, inflammatory activation, and capillarization. However, the mechanisms driving these changes and their contribution to disease progression remain incompletely understood, especially in a human setting.

In this project, you will use human induced pluripotent stem cell (iPSC)-derived LSECs as an *in vitro* model to investigate how circulating factors in patient-derived serum affect endothelial phenotype and function. You will combine functional cell-based assays with molecular profiling and integrate your findings with existing multi-omics datasets, including single-cell RNA-sequencing and OLINK plasma proteomics data.

You will contribute to:

- Culture, differentiation, and characterization of human iPSC-derived LSEC-like cells
- Biobanking of patient blood and serum samples
- Exposure of LSEC-like cells to patient-derived serum and assessment of disease-associated endothelial responses
- Functional characterization of endothelial phenotype, including barrier integrity/permeability assays, cell viability, inflammatory activation, and morphological analysis
- Immunofluorescence staining, microscopy, and quantitative image analysis
- Molecular assays, including RNA isolation, RT-qPCR, Western blotting, and bulk transcriptomic profiling
- Perturbation experiments using CRISPR-based approaches and/or pharmacological inhibitors to investigate candidate disease pathways
- Integration and interpretation of experimental findings with existing single-cell transcriptomic and OLINK plasma proteomic datasets
- Presentation of results in lab meetings

## The candidate

- Be enrolled in a Master's programme in life sciences, molecular biology, biotechnology, biomedical sciences, bioengineering, medicine, or a related discipline
- Have a strong interest in vascular biology, liver disease, stem-cell models, and/or translational research
- Have prior practical laboratory experience in mammalian cell culture and basic molecular biology techniques
- Preferably have an interest in data analysis and omics technologies; prior programming experience in R or Python is welcome but not required

# The Research Group

The goal of the Laura de Rooij laboratory is to study the gene expression landscape of the vascular endothelium, one cell at a time. Utilizing advanced single-cell RNA sequencing technologies, our lab is dedicated to mapping the diverse landscape of endothelial cell heterogeneity across various organs, tissues, pathological conditions, and throughout the aging process. Through this comprehensive approach, we seek to uncover novel genes and molecular pathways linked to vascular aging and disease. The major lines of current research in the lab involve healthy human aging, cellular senescence, and liver cirrhosis.

Our lab utilizes both human umbilical vein endothelial cells (HUVECs) and endothelial cells derived from human induced pluripotent stem cells (iPSCs) to investigate the biology and aging characteristics of the endothelium. For iPSC-derived endothelial cells (iECs), we employ a variety of innovative approaches, such as the application of growth factor cocktails and transcription factor induction, to generate endothelial cells that more closely mimic the characteristics of the endothelium in specific human organs and tissues. These tailored iECs, along with standard endothelial cultures, are further refined through the use of advanced 3D culture systems, including vessel-on-chip setups. By recreating the natural environment, we are able to expose these cells to tissue-specific signals, including co-culture with other cell types and extracellular matrix cues, to drive their differentiation and functional specialization. Via gene perturbation experiments, we furthermore aim to dissect the molecular mechanisms that underpin phenotypes of endothelial pathology and aging. This multifaceted approach enables us to gain deeper insights into endothelial function, disease progression, and aging at a cellular level.

**The Principal Investigator** (https://scholar.google.com/citations?user=9qSsTcIAAAAJ)

Laura de Rooij studied biomedical sciences at the University of Amsterdam (The Netherlands). She then joined the Stem Cell and Cancer Research Institute at McMaster University in Hamilton (Canada), where she studied the role of RNA-binding proteins in leukemic stem cells via an in vivo two-step CRISPR-Cas9-mediated screening approach. For her postdoctoral studies, she returned to Europe to work under the mentorship of Professor Carmeliet in the lab of Angiogenesis and Vascular Metabolism at VIB-KU Leuven (Belgium). There, she led and contributed to numerous single-cell transcriptome atlases of endothelial cells, generated from a diverse range of tissues, preclinical models, and clinical patient material in health and disease. Her studies have shed new light on the degree of vessel subtype heterogeneity in different tissues, as well as the altered composition and rewired molecular circuitries of endothelial cell subtypes in disease. Moreover, her efforts led to the discovery of previously unknown vascular subtypes and functions, including endothelial cells with a lipid-processing phenotype and potential prognostic relevance in breast cancer, and endothelial cells with a putative profibrotic function in COVID-19. Laura de Rooij joined CeMM as principal investigator in September 2022. Since then, her lab focuses on deciphering the transcriptomic landscape and the role of endothelial cells in human health, aging, and pathology.

Previously, Laura received numerous prestigious grants and awards, including an FWO Postdoctoral Fellowship (2020-2022, Belgium), a Lorne F. Lambier, Q.C. Scholarship (2015-2016, Canada), and a Young talent award (2014-2017, Prins Bernhard Cultuurfonds, the Netherlands). Since starting the lab, she moreover received independent funding via an FWF Herzfelder Foundation Projects Grant (Circulating endothelial cells as vascular aging sensors), as well as a Ludwig Boltzmann Gesellschaft Clinical Research Groups grant (Disease-driving mechanisms in patients with portal hypertension). In the latter, she co-leads a work package on vascular heterogeneity and angiogenesis in advanced chronic liver disease.

## About the Institute

CeMM is an international research institute of the Austrian Academy of Sciences and a founding member of EU-LIFE. The mission of CeMM, the Research Center for Molecular Medicine of the Austrian Academy of Sciences is to achieve maximum scientific innovation in molecular medicine to improve healthcare. At CeMM, an international and creative team of scientists and medical doctors pursues free-minded basic life science research in a large and vibrant hospital environment of outstanding medical tradition and practice. At CeMM, an international and creative team of scientists and medical doctors pursues free-minded basic life science research in a large and vibrant hospital environment of outstanding medical tradition and practice. CeMM's research is based on post-genomic technologies and focuses on societally important diseases, such as immune disorders and infections, cancer, aging and metabolic disorders. CeMM operates in a unique mode of super-cooperation, connecting biology with medicine, experiments with computation, discovery with translation, and science with society and the arts. CeMM discovers and develops technologies to explore human biology with the purpose of defeating disease at its roots. Because Science is our Medicine! CeMM trains a modern blend of biomedical scientists and is located at the campus of the General Hospital and the Medical University of Vienna. CeMM is a proud recipient of the HR Excellence in Research Award (HRS4R). This award indicates that CeMM takes care of the well-being of its employees, that the recruitment process is open, fair, and transparent, and that CeMM offers professional appraisals and career development procedures.  More than 150 people from 49 nationalities are working at CeMM. The institute promotes equal opportunity and harbors a mix of different talents, backgrounds, competences, and interests. www.cemm.at

## We offer

- Work within an experienced, interdisciplinary, and international team at one of Austria's leading research institutes
- Ample opportunities to contribute and gain experience in a key area of biomedical research and precision medicine
- An inspiring workplace with an international setting, strong team spirit, and an excellent work climate
- A wide range of social, cultural, and sports activities organized by the institute
- Excellent employee benefits including full insurance coverage (health, accident, retirement), health care services, subsidized cafeteria
- Monthly gross salary of  EUR 1.379,60 for 20 hours/ week (following the recommendations of FWF)
- Support for relocating to Vienna is provided (relocation reimbursement, visa support, etc.)

Please apply online( https://cemm.onlyfy.jobs/job/e6cuoxft) with cover letter, CV, academic transcripts, proof of master's enrollment, and contact details of two referees. Applications will be reviewed on a rolling basis. Any application received by 6 January 2027 will be considered. Start date is flexible.

## Additional information

| | |
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| City | **Vienna** |
| Position type | **Part-time employee** |
| Start of work | **01.03.2027** |

## Responsible

Memo Mokhles

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