PhD Positions – Periodontal Remodelling and Systemic Diseases

Collaborative Research Centre (CRC/SFB 1739)

University Hospital RWTH Aachen, RWTH Aachen University

Welcome to RWTH Aachen University and University Hospital RWTH Aachen!

Are you interested in understanding how systemic diseases influence tissue regeneration and degeneration? Do you want to work at the interface of dentistry, medicine, biology, engineering, and translational research?

Join the newly funded Collaborative Research Centre (CRC/SFB 1739): "Soft tissue–alveolar bone crosstalk – Impact of systemic diseases on mechanisms of periodontal remodelling", funded by the German Research Foundation (DFG).

We are recruiting highly motivated doctoral researchers to investigate how chronic diseases such as chronic kidney disease, cardiovascular disease, liver disease, hematological malignancies, and skeletal disorders affect the biological mechanisms that maintain periodontal health and tissue regeneration.

About CRC/SFB 1739

Periodontal remodelling is essential for maintaining oral health, preserving tooth support, enabling orthodontic treatment, and preventing tissue degeneration. However, increasing evidence demonstrates that systemic diseases profoundly influence periodontal homeostasis and regenerative capacity.

CRC/SFB 1739 brings together researchers from dentistry, medicine, life sciences, engineering, imaging, computational biology, and molecular medicine to establish a new interdisciplinary framework for understanding periodontal-systemic crosstalk and developing innovative diagnostic and therapeutic strategies.

The consortium includes more than 30 principal investigators and combines expertise from clinical dentistry, internal medicine, cardiovascular research, nephrology, oncology, imaging, stem cell biology, biomaterials, microbiology, systems biology and molecular medicine.

Doctoral researchers will contribute to projects addressing:

- Mechanisms of periodontal remodelling in health and disease
- Chronic kidney disease and periodontal crosstalk

- Cardiovascular disease and heart failure
- Liver disease and metabolic dysfunction
- Hematological malignancies
- Inflammation and immune regulation
- Stem cell biology and tissue regeneration
- Oral microbiome and biofilm research
- Advanced imaging technologies
- Omics technologies, proteomics, metabolomics and mass spectrometry
- Biomaterials and tissue engineering
- Experimental disease models
- Translational and clinical research

Depending on the selected project, PhD candidates will work with patient cohorts, experimental models, advanced imaging technologies, molecular biology, mass spectrometry, bioinformatics, biomaterials, or computational approaches.

PhD project P 09: Elucidating circuits of periodontal-liver crosstalk in metabolic liver disease

Promotor:
Univ.-Prof. Dr. med. dent. Stefan Wolfart, Dept. of Prosthodontics and Biomaterials, Center for Implantology, University Hospital Aachen

Do diseased gums and a diseased liver drive one another?

Periodontitis and metabolic associated liver disease are two of the most prevalent diseases worldwide, and emerging evidence points to a possible bidirectional relationship between them. Our own preliminary experiments support this notion: periodontitis (induced by silk ligature) and liver disease (induced by a western-style diet) could exacerbate each other, potentially leading to worsened overall health outcomes. This project aims to uncover the molecular circuits underlying this interaction – and translate them into clinically actionable insights.
What distinguishes this project is its ability to trace one biological axis across scales – from causal mechanism in mice to clinical relevance in patients – combining complementary mouse models with a prospective human cohort.

To address this question, we will work with the following models, techniques and samples:

- Combined ligature- and diet-induced mouse model of periodontitis and liver disease
- Genetic mouse model of steatohepatitis (NEMOΔhepa), independent of dietary intervention
- Metabolic cages for phenotyping of food intake, activity and energy expenditure
- µCT imaging, histology and gene expression analysis of periodontal bone loss
- Microbiota profiling (oral and gut) and intestinal barrier function assessment
- Pharmacological modulation of gastric bacterial translocation (PPI treatment)
- Glucose tolerance testing and metabolic characterization
- Prospective clinical cohort of liver transplant patients with longitudinal dental examinations (Pocket Probing Depth, gingival indices) and multi-site sampling (teeth, prostheses, implants) for immunological and microbiome analyses
- Parallel medical monitoring of blood, stool, bile and urine, alongside saliva, to assess oral/gut microbiota shifts, bile acid metabolism and systemic inflammatory markers before and after transplantation

What You Bring

We are looking for ambitious and enthusiastic candidates who:

- Hold (or will soon obtain) an MSc degree (or an equivalent qualification, e.g. Staatsexamen) in Biology, Biomedicine, Biotechnology, Molecular Medicine, Biochemistry, Bioinformatics, Biomedical Engineering, Dentistry, Medicine, or a related discipline
- Have a strong interest in translational biomedical research.
- Enjoy working in interdisciplinary teams.
- Possess excellent communication skills.
- Are highly motivated and scientifically curious.
- Have good written and spoken English skills.

What We Offer

As a doctoral researcher within CRC/SFB 1739, you will benefit from:

- A PhD position (65% according to the German public service salary scale TV-L E13) within this project, jointly supervised by PI Univ.-Prof. Dr. med. dent. Stefan Wolfart (Department of Prosthodontics and Biomaterials) and Co-PI Univ.-Prof. Dr. med. Dr. rer. nat. Kai Markus Schneider (Department of Medicine I, University Hospital Dresden); specific responsibilities will be assigned according to candidates' background and interests.
- Access to state-of-the-art research infrastructure.

- Participation in a newly established DFG-funded Collaborative Research Centre.
- Interdisciplinary supervision by leading experts in dentistry, medicine and life sciences.
- Structured doctoral training through the Integrated Research Training Group. Opportunities for international collaboration and scientific exchange.
- A vibrant and highly collaborative research environment.

Doctoral Degree Opportunities

Depending on the candidate's academic background and supervising faculty, doctoral researchers may pursue: **Dr.rer.nat., Dr.med.dent., Dr.med., Dr. rer. medic.** subject to the applicable doctoral regulations and admission requirements.

Integrated Research Training Group (IRTG)

All doctoral researchers will become members of the CRC 1739 Integrated Research Training Group (IRTG), which provides:

- Structured doctoral training
- Interdisciplinary supervision
- Scientific and transferable skills workshops
- Career development support
- International networking opportunities
- Research exchanges with collaborating institutions
- Mentoring and individual career planning

The IRTG is designed to foster interactions between dental, medical and basic science disciplines and to train the next generation of researchers in periodontal-systemic disease research.

About RWTH Aachen University

RWTH Aachen University is one of Europe's leading universities for science, engineering and medicine. University Hospital RWTH Aachen provides a highly interdisciplinary research environment and is internationally recognized for excellence in translational biomedical research, systems medicine and organ crosstalk research.

Interested?

For more information, contact **Prof**. **Dr. Stefan Wolfart** (swolfart@ukaachen.de) & **Dr. Taşkın Tuna** (ttuna@ukaachen.de).

To apply, submit your CV, motivation letter, and reference letter.

application procedures can be found on the CRC/SFB 1739 website: https://www.ukaachen.de/kliniken-institute/sfb1739-weichgewebe-knochen-crosstalk/karriere/