

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: Heart Failure–Oral Crosstalk: Impact of Cardiovascular Disease on Periodontal Remodelling

Promotor: Dr. rer. nat. Marta Rizk, Department of Orthodontics

This project investigates how heart failure affects periodontal homeostasis and tissue remodelling, with a particular focus on alveolar bone, periodontal ligament, and surrounding oral tissues. Increasing evidence suggests that cardiovascular diseases influence inflammatory responses, vascularisation, mineral metabolism, and regenerative capacity within the periodontium. However, the mechanisms underlying heart–oral crosstalk remain poorly understood.

The doctoral researcher will analyse structural and cellular alterations in the oral cavity using high-resolution micro-computed tomography (micro-CT), histology, and quantitative image analysis. The project will utilise established animal models of heart failure to investigate changes in bone morphology, periodontal ligament architecture, soft tissue integrity, and tissue remodelling dynamics. In close collaboration with cardiovascular researchers, pathologists, and imaging scientists, the candidate will contribute to understanding how systemic cardiovascular dysfunction influences oral health.

The project combines advanced imaging technologies, histomorphometry, computational image analysis, and translational biomedical research. Particular emphasis will be placed on developing quantitative and reproducible workflows for assessing periodontal remodelling and identifying tissue characteristics associated with systemic disease.

What You Bring

We are looking for ambitious and enthusiastic candidates who:

- Hold (or will soon obtain) an MSc degree in Biomedical Imaging, Medical Physics, Biophysics, Physics, Bioengineering, Computational Biology, Biomedical Engineering, or a related discipline.
- Have experience with image analysis and/or tomography datasets.
- Have a strong interest in translational biomedical research and oral-systemic disease interactions.
- Possess basic knowledge of medicine, dental medicine, or biology.
- Have programming skills (Python, MATLAB, Fiji/ImageJ, or similar); experience is advantageous but not mandatory.
- Have a basic understanding of preclinical research and interest in laboratory-based scientific work; previous experience is a plus.
- Experience with artificial intelligence, machine learning, or deep learning approaches is a plus.
- Enjoy working in interdisciplinary teams and collaborating across clinical and scientific disciplines.
- Possess excellent communication skills and good written and spoken English.
- Are highly motivated and scientifically curious.

What We Offer

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

- A funded PhD position according to the German public service salary scale (TV-L E13 65%).
- 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.

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 **Dr. rer. nat. Marta Rizk** (mrizk@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/>