

The oral cavity is unique in its microbiology, connective tissue structures, and host responses. Moreover, oral diseases present unsolved scientific challenges and novel biological phenomena. The importance of understanding the oral biology of diseases, whose incidence and severity increase with age, is clearly understood within the context of current demographic trends.

A PhD in Oral Biology is offered by The Division of Oral Biology in the Department of Molecular and Cell Biology, Boston University Henry M. Goldman School of Dental Medicine (GSDM). This program is administered through the Division of Graduate Medical Sciences of Boston University School of Medicine and is part of the Program in Biomedical Sciences (PIBS).

Program Description

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THE PROGRAM:

- Recruits students with strong backgrounds in the life and basic sciences who are interested in additional advanced training in dental and medical sciences. Applicants should have a BS in a life science; DMDs and MDs or equivalent can be eligible depending on the strength of scientific training.
- Aims to educate students in modern scientific approaches to oral biology and oral disease research.
- Accommodates and trains students whose primary goal is to pursue research in oral biology as a primary professional activity.

The PhD Program in Oral Biology adds a new dimension to graduate programs at the GSDM. It is not a substitute for the existing DSc degree in Oral Biology. The DSc program is limited to three years, and provides dentists the opportunity to expand knowledge in basic science research related to oral biology. Students typically complete 20 credits of didactic course work. In contrast, the PhD program will train people whose goals are to pursue research in oral biology as a primary professional activity. The PhD will typically require five years, with extensive didactic and research training described below. Thus, compared to the DSc degree, the PhD Program in Oral Biology will be longer in duration, more rigorous, and will prepare students for a career in basic oral biology research.

Research Opportunities & Topics

AMONG THE RESEARCH TOPICS EXPLORED IN ORAL BIOLOGY ARE:

- Structure, function, biosynthesis, and genetics of salivary proteins
- Post-translational modifications, with particular emphasis on phosphorylation of salivary proteins
- Protein-mineral interactions and their role in the function of hard tissues
- Mechanisms of pellicle and plaque formation; mechanisms and regulation of exocrine processes
- Mechanisms of celiac disease
- Oral host defense mechanisms in caries and periodontal disease
- Intercellular signaling, focusing on chemotaxis of monocytes to inflamed tissues
- Regulation of connective tissue accumulation in mineralized and non-mineralized oral tissues
- Production of growth and chemotactic factors by normal and transformed mesenchymal and hematopoietic cells
- Connective tissue production by primary periodontal cells and effects of fibrogenic drugs and cytokines
- Mechanisms of tumor suppression
- Molecular and cellular aspects of oral cancer to develop novel therapeutic opportunities
- Regulation of genes
- Altered inflammatory cell signal transduction pathways in Juvenile Periodontitis, and control of periodontal tissue regeneration
- Genetic mouse models of inherited human oral pathologies to determine molecular mechanisms of disease
- Osteocyte biology and systemic interactions
- Mechanisms of mitochondrial diseases
- Mechanisms of pancreatitis
- Cell stress and regulation of gene expression

In addition, research projects may include clinical components focusing on inflammation, periodontal disease, tissue fibrosis, aging, developmental defects, and oral cancer. These studies will be carried out in collaboration with the clinical faculty at Clinical Research Center, located at the Henry M. Goldman School of Dental Medicine.



Faculty PhD Mentors

Department of Molecular and Cell Biology

Dr. David Levin, PhD

Professor and Chair
Department of Molecular & Cell Biology

Salomon Amar, DMD, PhD

Professor
Director of the Center for Anti-Inflammatory Therapeutics

Ruslan Afasizhev, PhD

Professor

Inna Afasizheva, PhD

Assistant Professor

Paola Divieti Pajevic, MD, PhD

Associate Professor

Eva Helmerhorst, PhD

Associate Professor

Maria Kukuruzinska, PhD

Professor
Associate Dean for Research

Yoshiyuki Mochida, DDS, PhD

Associate Professor

Barbara Nikolajczyk, PhD

Associate Professor of Microbiology

Frank Oppenheim, DMD, PhD

Professor
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PHD in Oral Biology