IN VITRO PERIODONTAL LIGAMENT MODEL TO ASSESS SYNTHETIC SELF ASSEMBLING PEPTIDES FOR REGENERATION

Nina Meyer1, Franziska Koch2, Ronald Jung3 and Stephanie Mathes1
1Zurich University of Applied Sciences, ICBC, Tissue Engineering, Wädenswil, Switzerland
2Institute for Chemistry and Bioanalytics, University of Applied Sciences (FHNW), Switzerland
3Clinic of Fixed and Removable Prosthodontics and Dental Material Science, University of Zurich, Zurich, Switzerland

Objectives
The periodontal ligament represents a complex tissue structure between the tooth cementum and the alveolar bone. The matrix is build up by periodontal ligament fibroblasts (PDLF) that produce their ECM, which mainly consists of collagen. During periodontitis this structure is severely affected. In order to enable tissue regeneration a new matrix based on self-assembling peptides (SAPs) will be introduced into the defect site. In order to avoid unnecessary animal trials and to receive relevant biological information in an early phase of product development, a relevant human tissue model of the periodontal gap was developed.

Conclusion
Periodontal treatment has emerged to one of the most important issues in dentistry. The established in vitro model of the periodontal ligament is feasible to assess important process steps of tissue regeneration. In vitro investigations made the positive effect of P 11-4 and P 11-8 SAPs for periodontal tissue regeneration apparent. These peptides will subsequently be evaluated in an in vivo animal trial to assess the efficacy in an environment where microorganisms and immune cells are present.

Methods
• Matrix / surface interaction: Evaluation of interaction of SAP P11-4 with dentin surface using fluorescent labeled peptide
• Matrix /cell interaction: Evaluation of cell adhesion and proliferation on SAP matrices by viability assays and evaluation of cell migration into SAP matrices by fluorescence microscopy
• Matrix / tissue interaction: Evaluation of migration of cells in SAP gels on dentin surface

Results

Matrix / surface interaction
P11-4 labeled with fluorophore; interaction with dentin surface for 24h; samples were de-mineralized and cut using a cryotome

Strong interaction of peptide and dentin surface and inside dentin channels

Matrix / tissue interaction

A B C

In vitro model of the periodontal pocket of 5 mm. (A) Schematic drawing, (B) periodontal model with PDLF containing collagen hydrogel (pink) and dentin surface (yellow) surrounded by agarose. (C) Analysis of cell migration distance after MTT staining

Homogeneous migration of PDLF cells in periodontal model is most obvious for P11-8

Acknowledgments: We gratefully thank the CTI for project funding.