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Self- Assembling Peptides As Novel Treatment Strategy To Regenerate Periodontal Ligament

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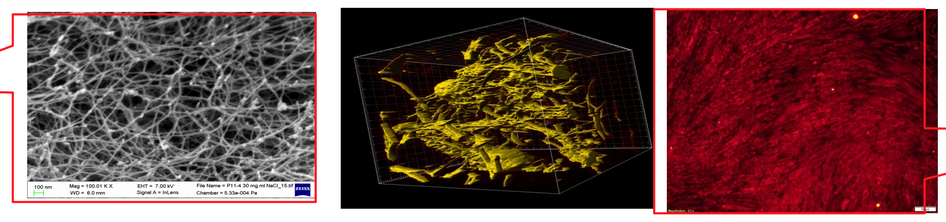
Scientific Innovation

Periodontitis is an inflammation of the periodontium caused by the invasion of pathologic bacteria between the gum and the tooth crown. Further progression of the disease leads to the degradation of collagen fibers of the periodontal ligament and alveolar bone. Severe cases results in tooth lost can result. Due to microbiological colonization and defect size therapeutically intervention is necessary. The new treatment strategy based on an **injectable self assembling peptide system** serves as an extracellular matrix (ECM) where cells are able to adhere and to proliferate into newly synthesized tissue. In order to figure out which peptides are most suited for the task, an 3D *in vitro* model system was designed.

PROJECT GOAL



Injected Self-Assembling Peptide (SAP) with the fibrillary structure (Fig1) enhanced the cells migration (Fig 2) and build up of ECM e.g. collagen 1 (Fig 3)

Regenerated Periodontium

KEY FINDINGS

Migration:

The *in vitro* model of a periodontal pocket was used to assess the migration distance of periodontal ligament fibroblasts (PDLF) out of the donor compartment. With P11-8 and P11-4 a migration distance of over 2 mm could be reached

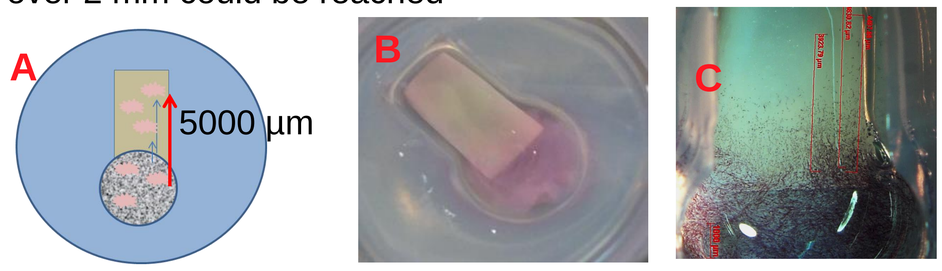


Figure 4 *: In vitro* model of the periodontal pocket of 5 cm (A), includes dentin and collagen as a host of PDLF measurement of migration distance out of donor compartment on P11-8 coated dentin surface with MTT (C).

	P11-4	P11-8	P11-13/14	P11-28/29	Collagen
Migration Distanz [µm]	**3175** +/- 1666	**2119** +/- 78	1375 +/- 323	885 +/- 376	3697 +/- 518

Table 1: Migration distance measured after 8 days, detected with MTT ; n= 3; The proof of concept of the model was done with collagen

Proliferation and ECM production:

Bone cells grow and build up ECM so they are able to adhere and to proliferate into the newly synthesized tissue.

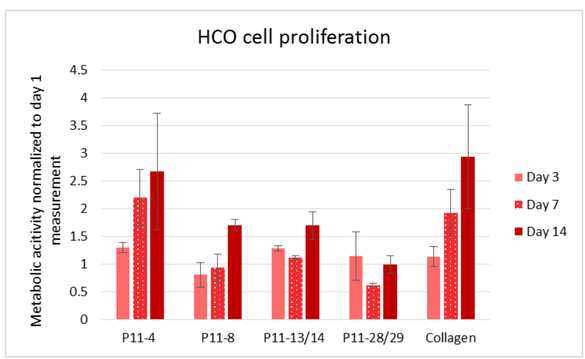


Figure 5 Cell proliferation of human calvarial osteoblasts (HCO) after 3, 7 and 14 days incubation with SAP (15 mg/ml). Collagen (1.5 mg/ml) was used as a test system control. Cell proliferation was measured by the metabolic conversion of PrestoBlue viability reagent. Data were normalized in respect to values measured at day 1.

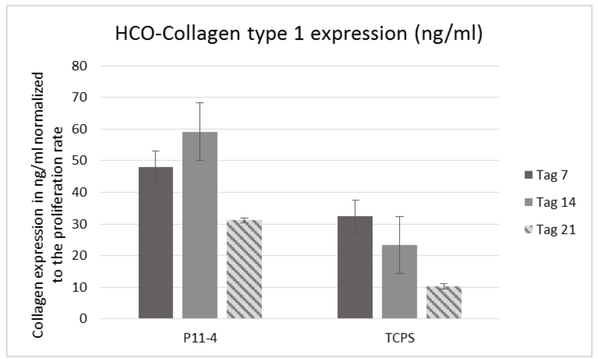


Figure 6 Collagen type 1 expression of HCO after 7, 14 and 21 days incubation with P11-4 (15 mg/ml). Cells grown on tissue culture plates (TCPS) were used as a control. Cell proliferation was measured by the metabolic conversion of PrestoBlue viability reagent. Data were normalized in respect to values measured at day 1.

Business Potential

The global need for periodontal regenerative methods is urgent and huge. Periodontitis is the number 6. disease worldwide.
As there is no convincing device on the market that leads to the healing of periodontitis, there is a strong need for a less painful and less invasive treatment than those currently standards.

Country	Mild	Moderate	Severe
USA	8.7%	30 %	8.5 %
Germany	44.8 %	42 %	13.2 %
Switzerland	60-84 %	15-33 %	4-7 %

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Conclusion

P 11-4 and **P 11-8** are the most suitable candidates for the regeneration of the periodontal defect.

Strength of peptide approach:
- Peptide has a hydrogel- character
- Covers the gab between dentin and gingiva or bone
- Less painful
- Free of animal or human proteins
- Fast application (within 5 minutes)

Chances of peptide approach for regeneration:
- Treatment of mild-moderate periodontitis
- Compatible with other regenerative biomaterials
- Possible to functionalize as a drug delivery system
- Expansion of credentis' product portfolio