Remineralisation of carious lesions by self-assembled peptide supramolecular networks

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ABSTRACT
The investigation of a non-invasive, regenerative remineralization method of sub-surface carious lesions/ early caries lesions in tooth enamel is the field of attention in this project. P11-4 is a short peptide, which self-assembles in a supramolecular 3D network after applying in the carious lesion. The hypothesis is that this self-assembled structure triggers nucleation of de-novo hydroxyapatite nanocrystals and consequently results in remineralization [1].

RESULTS
CT measurements represented a successful remineralisation status in vitro in white spot lesions of human teeth according to the test duration (Fig. 2). Experiments with MALDI-TOF showed, that the peptide remained in artificial white spot lesion in a stable and unimpaired state of human teeth according to the test duration.

METHODS - Biomineralisation study
To observe the process of self assembling and biominetic mineralisation, artificial white spot lesions were induced into human tooth followed by treatment with peptide P11-4.

The remineralisation process was analyzed by matrix-assisted desorption/ionization – time of flight (MALDI-TOF) spectroscopy and μ-computer tomography (μ-CT).

CONCLUSIONS
Primary results with μ-CT showed a significant increase of remineralisation in artificial induced early caries lesions. Furthermore MALDI-TOF analysis proved that the peptide P11-4 was remaining inside the lesion. In addition a suitable technology was developed to process hydroxyapatite into an artificial tooth model with similar mechanical and chemical properties compared to human teeth for testing of other behavior of P11-4 and new compounds to cure caries.

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