Vita Zalite et al., Dentistry 2016, 6:9 (Suppl)
http://dx.doi.org/10.4172/2161-1122.C1.006

The design of calcium phosphate particle for tooth hard tissue remineralization

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Dental caries is a world-wide oral disease. At the initial stage of caries lesions, cariogenic bacteria attack tooth enamel, leading to demineralized areas on the tooth surface. Therefore, the investigation includes the design of calcium phosphate (CaP) particles with caries preventive effect due to bioavailable calcium and tailored particle morphology. The aim is to obtain CaP particles with properties close to enamel crystals (20-100 nm) and dentine tubules (2-4 μm). CaO and H_3PO_4 were used as precursors to synthesize CaP. The Ca/P ratio of products was chosen under 1.67 to obtain calcium deficient hydroxyapatite. One part of the product was spray-dried (spCaP) and remaining part- left as paste (pCaP). The evaluation of products composition by X-ray diffraction (XRD) and fourier transform infrared spectrometry (FTIR) was done. Morphology was investigated by scanning electron microscopy (SEM). FTIR showed a characteristic vibrations of functional groups of apatite. XRD patterns confirmed apatite phase with low crystallinity. The Ca/P ratio was in the range from 1.64 to 1.60. SEM micrographs showed nanorods (length 50-200 nm, diameter 25-60 nm) for pCaP and spherical agglomerates (1-10 μm) for spCaP samples. The obtained CaP are chemically very similar to dental hard tissues. In addition, the morphology of pCaP particles is compatible with enamel crystals while size of spCaP agglomerates fits well with the dimensions of dentine tubules. The combination of pCaP and spCaP have a potential to decrease a risk of caries development and this hypothesis will be tested during *in vitro* studies.

Biography

Vita Zalite has completed his PhD in Material Science at Riga Technical University (RTU). He is a Researcher at Rudolfs Cimdins Riga Biomaterials and Development Centre (RC RBIAC).

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