

## TS012

### Development of a bilayered system for periodontal regeneration using tissue engineering approaches

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Periodontitis is a prevalent gram negative infection disease that causes the destruction of the tooth supportive tissues. Effective treatment of periodontal disease is important, since periodontal disease is correlated with several systemic diseases. However, adult periodontal tissues have a low potential of self-renewing and regeneration. Concerted efforts have been made to accelerate periodontal tissue regeneration, using a plethora of techniques including grafting materials, signalling molecules and cell-based tissue engineering. Nevertheless, a strategy for predictable reconstruction of normal structure and functionality of periodontal damaged tissue is still missing. In this work, we propose the development of a bilayered system for the regeneration of alveolar bone and periodontal ligament. This system consists of a bilayered composite made of calcium phosphate (CaP) cement incorporating hyaluronic acid microspheres loaded with Platelet Lysates (PL) and a hydrogel layer based on PL, harbouring mesenchymal stem cells (MSCs). The advantage of this strategy lies in the ability to develop a system that can be easily injected and which provides adequate mechanical support, both initially and during new tissue ingrowth. After the degradation of the HA microspheres incorporated in the CaP cement, a fully interconnected network can be created, which leads to rapid penetration of bone-forming cells into the CaP cement. Additionally, the distinct degradation rates of the components of the bilayered system allow a controlled release of the entrapped growth factors and further accelerate the periodontal tissues remodelling process, mimicking the physiologic wound healing process. The data collected suggests that it is possible to fabricate the cement composite layer incorporating PL from which a number of growth factors are released in a controlled manner. Moreover, the cement composites incorporating HA microspheres loaded with PL show low cytotoxic values and induce the expression of early markers of osteogenic differentiation in human adipose-derived stem cells (hACS).