FEASIBILITY OF A NEW DUAL-PASTE PRESENTATION OF INJECTABLE BRUSHITE CEMENTS

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This work focuses on injectable calcium phosphate cements (CPC) which, in contrast to conventional hydroxyapatite cements, are converted into brushite (dicalcium phosphate dihydrate, DCPD) as a result of their consolidation processes. The so–called brushite cements are prepared by adding water to mixtures of β-tricalcium phosphate (β-TCP) and monocalcium phosphate monohydrate (MCPM) powders, in such proportions as to obtain flowable pastes. Setting and consolidation occur as a result of dissolution-precipitation reactions inducing the formation of new brushite crystals in de cement paste. As DCPD has higher solubility than hydroxyapatite (HAP) in physiological conditions, brushite cements are expected to show superior biodegradability and faster resorption in clinical applications.

Previous *in vivo* investigations have shown that brushite cements are promising synthetic materials for the reconstruction of bone defects [1,2]. Compared to other biocompatible polymeric cements used so far, this inorganic material meets numerous interesting specifications such as : injectability, workability, low heat release upon setting, *in situ* consolidation, biodegrability, resorbability and osteoconductibility, thus enabling bone regeneration.

The step of developement presented here is related to a brushite cement formulation dedicated to the treatment of parodontic lesions in the dental field. This work aims at achieving a new galenic presentation of ready–to-use cements, consisting in two pre–mixed pastes loaded into a twin–barrel syringe device equipped with a static mixing nozzle.

The study is focused on the working characteristics of the two pre–mixed pastes, namely :

– Their composition, including rheological additives and setting regulators,

– Their rheological properties prior to mixing,

– Their stability on storage after separate loading into a twin–barrel syringe,

– The working properties of the so–obtained brushite cements : working and setting times, mechanical performances.

The experience gained so far demonstrates the feasibility of dual–paste brushite cement formulations, showing excellent working properties and good stability on storage for over 6 months.

Future work will concentrate on the long–term stability of dual–paste brushite formulations, and on the effects of sterilisation (–irradiation *vs* autoclaving) on their stability on storage and on their final working properties.

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[1] Ohura K., Bohner M., Hardouin P., Lemaître J., Pasquier G., Flautre B., & Blary M. C. "Resorption and bone formation of new β-tricalcium phosphate-monocalcium phosphate cements : an *in vivo* study." *J. Biomed. Mater. Res.* 30, 193-200, 1996.

[2] Ikenaga M., Hardouin P., Lemaître J., Andrianjatovo H., & Flautre B. "Biomechanical characterization of a biodegradable calcium phosphate cement : Comparison with porous biphasic calcium phosphate ceramics." *J. Biomed. Mater. Res.* 40(1), 139-144, 1998.