

Fabrication of octacalcium phosphate block through a dissolution-precipitation reaction and its biological evaluation

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Although octacalcium phosphate (OCP) powder and a collagen/gelatin composite demonstrate good potential as bone substitutes, an OCP block has not been fabricated to date. In this study, the feasibility of fabricating an OCP block was evaluated through a dissolution-precipitation reaction using a calcium sulfate hemihydrate (CSH) block as a precursor. When the block was immersed in a phosphate salt solution, its composition changed to that of OCP, while its structure was maintained. The diametral tensile strength (DTS) of the OCP block was 1.0 ± 0.2 MPa. The macroporosity and microporosity of the OCP block were $33.4 \pm 4.5\%$ and $69.0 \pm 1.6\%$, respectively. New bone attached well to the OCP block, and this block was partially replaced by bone 2 weeks after implantation. Four weeks after implantation, the surface of the OCP block was nearly covered with new bone and ~30% of the block was replaced by new bone, while no replacement by bone was observed in the case of a hydroxyapatite (HAp) block used as a control. It is concluded that OCP blocks are potentially suitable for their use as artificial bone substitutes.

Keywords: Calcium phosphate, bone substitute, biomaterial