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Enhancing Protein Incorporation in Calcium Phosphate Coating on Titanium by Rapid Biomimetic Co-Precipitation Technique

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Abstract : Calcium phosphate coating (CaP) has been employed for protein delivery, but the typical direct protein adsorption on the coating led to low incorporation content and fast release of the protein from the coating. By using bovine serum albumin (BSA) as a model protein, rapid biomimetic co-precipitation between calcium phosphate and BSA was employed to control the distribution of BSA within calcium phosphate coating during biomimetic formation on titanium surface for only 6 h at 50 oC in an accelerated calcium phosphate solution. As a result, the amount of BSA incorporation and release duration could be increased by using a rapid biomimetic co-precipitation technique. Up to 43 fold increases in the BSA incorporation content and the increase from 6 h to more than 360 h in release duration compared to typical direct adsorption technique were observed depending on the initial BSA concentration used during co-precipitation (1, 10, and 100 microgram/ml). From X-ray diffraction and Fourier transform infrared spectroscopy studies, the coating composition was not altered with the incorporation of BSA by this rapid biomimetic co-precipitation and mainly comprised octacalcium phosphate and hydroxyapatite. However, the microstructure of calcium phosphate crystals changed from straight, plate-like units to curved, plate-like units with increasing BSA content.

Keywords : biomimetic, Calcium Phosphate Coating, protein, titanium
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