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Electrochemical deposition of mineralized collagen coatings on a metallic substrate

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Natural bone consists of collagen and calcium phosphate (CaP), as-called mineralized collagen. Therefore, mineralized collagen coatings on metallic implants have been considered to create a more appropriate microenvironment for cellular growth, consequently to support early and better establishment of osseointegration. In this presentation, mineralized collagen coatings were electrochemically deposited on the metallic substrate through either constant potential or alternative potential ways. It was found that collagen fibrils bond to the metal substrate by calcium phosphates. Though, mineralized collagen is not good enough in improving cellular response and biological factor loading, such as rhBMP-2, which has been proven to be effective in osseointegration. Nevertheless, bare collagen shows enhanced capacity in promoting cells adhesion, proliferation, and differentiation of osteogenesis, as well as improved BMP loading capacity. It was found an electrochemical deposition method with alternative potentials is more effective in deposit mineralized collagen coatings with both advantages, since the microstructure of the coatings could be well controlled. The cytocompatibility and rhBMP-2 loading capability of the obtained coatings with controllable mineralization of the collagen were also evaluated. Moreover, the deposition mechanisms with constant potential or alternative potentials were discussed and compared.

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