Cobalt, chromium and nickel affect hydroxyapatite crystal growth in vitro

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Mots-clés	Crystal size [7], crystallinity [8], Hydroxyapatite [9], Metal [10], Mineralization [11]
Résumé en anglais	Metals are widely used in orthopaedics and recent studies have reported that patients with metal implants have a significant increase of metal levels in serum and synovial fluid. Femoral neck fracture occurred in some patients with metal-on-metal implants for unknown reasons. Recently, bone quality has emerged as an important factor of bone strength and few studies have investigated the effects of metal ions on hydroxyapatite properties. In the present study, we investigated the effects of Co2+, Cr3+ and Ni2+ on hydroxyapatite (HA) growth in vitro, using carboxymethylated poly(2-hydroxyethyl methacrylate) (pHEMA) as a biomaterial for calcification. We have demonstrated that metal ions reduced the quantity of mineral formed at the surface of the polymer and decreased the ratio Ca/P by 1.12-, 1.05- and 1.08-fold for Cr2+, Cr3+ and Ni2+ respectively. Furthermore, the size of calcospherites was significantly increased in the metal-doped HA compared to the controls, indicating a possible effect of metal ions on the crystal lattice. Indeed, the presence of metal ions increased the crystal size as well as the crystallinity of HA and reduce the lattice parameter c of the HA framework. The information obtained from this work suggests that the quality of the mineral around metallic implants could be altered. However, further investigation should be conducted to further elucidate the effects of metal incorporation on bone mineral and the functional consequences.
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