The efficiency of calcium phosphate biominerals for the remediation of complex radioactive contaminated waters

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Suitable decontamination agents are required to remediate radionuclides from complex environmental sites. For example, radioative contaminated seawater at the habour of the Fukushima Daiichi Nuclear Power Plant is a concern. This site poses remediation problems because of the high level activity and high concentration of competing ions (such as Na^{+}, Ca^{2+}, Mg^{2+}) that block potential adsorption sites on cleanup materials.

This study investigates a microbially produced calcium phosphate biomineral for the remediation of radioactive waters containing high levels of competing ions. *Serratia* sp. bacterium produces amorphous calcium phosphate (BHAP), with a larger specific surface area and a more reactive surface compared to synthetically produced hydroxyapatite [1]. Previous research has shown that BHAP can remediate up to 10 times more Sr^{2+} and Co^{2+} from groundwaters than commercially available hydroxyapatite [2].

In this study, the efficiency of BHAP sorbents for the removal of radionuclides from saline waters was tested against a commercial hydroxyapatite and a clinoptilolite. Initial results showed that BHAP was more efficient for Sr^{2+} and Co^{2+} uptake. For example, Co^{2+} sorption by clinoptilolite decreased from 6.95 mg g^{-1} in deionised water to 1.32 mg g^{-1} in 90% seawater. Whereas, BHAP Co^{2+} sorption only decreased from 8.07 mg g^{-1} in deionised water to 5.81 mg g^{-1} in 90% seawater.

[1] Oelkers and Montel, (2008) *Elements*, **4**, 113-116. [2] Handley-Sidhu et al., (2011) *Environ. Sci. Technol.* **45**, 6985-6990.