Poster Presentation

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Calcium phosphate phase transition in the presence of Aminosilane

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Calcium phosphate has been the point of interest for in vitro gene delivery for many years because of its biocompatibility and straight forward application. However, there are some limitations regarding in vivo administration of these particles mostly because of vast agglomeration of the particles and lack of strong bond between the particles and pDNA. We introduced a simple single step method to functionalize calcium phosphate nanoparticles with Aminosilanes having a different number of amine groups. The nanoparticles were characterized chemically and structurally and their toxicity and interaction with pDNA were studied as well. Results revealed that different crystalline phase of calcium phosphate nanoparticles (Brushite and Hydroxyapatite) with a size below 150 nm were prepared, depending on conditions of synthesis and phase, each with a narrow size distribution. The aminosilane agents caused oriented nucleation and growth of crystallites and can decrease the pH for producing hydroxyapatite phase. The phenomenon could be revealed with the presence of anisotropy in the structure of synthesized hydroxyapatite. The number of amine groups in the Aminosilane agent could change the phase transition pH. Brushite particles revealed to have stronger interaction with pDNA mostly because of their higher positive surface charge. Both particles showed blood compatibility and negligible toxicity. Transfection experiment revealed the capability of both brushite and hydroxyapatite particles to transfect A549 and HEK293 cells. The new modified nanoparticles can be stored in a dried state and re-dispersed easily at the time of administration. Moreover, the transfection efficiency is higher in comparison with conventional calcium phosphate. This study showed the impact of presence and type of the modifying agent on the crystal structure and the amount of surface functionalization of nanoparticles, which in consequence influenced their interaction with cells.

Keywords: Hydroxyapatite, Brushite, Aminosilane