INFLUENCE OF DIFFERENTLY STABILIZED SILVER NANOPARTICLES ON CALCIUM PHOSPHATE FORMATION AND TRANSFORMATION

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Calcium phosphate (CaP) composites with antimicrobial metal/metal oxide nanoparticles are emerging as a promising replacement for antibiotic therapy in implant-related infections. Silver nanoparticles (AgNPs) are attracting special attention due to their nonselective antibacterial activity.[1] A promising method of preparing CaP composites with AgNPs is precipitation.

The effect of differently stabilized silver nanoparticles on the formation and transformation of calcium phosphates was investigated. Polyvinylpyrrolidone (PVP), citrate (Cit) and sodium bis(2-ethylhexyl) sulfosuccinate (AOT) were used as stabilizers. Different effects on the rate of amorphous calcium phosphate (ACP) transformation to crystalline phase, as well as properties of formed amorphous and crystalline solid phases were observed depending on the type of AgNPs. After 60 min ageing time, in the control system ACP was transformed into mixture of calcium deficient hydroxyapatite (CaDHA) and small amount of octacalcium phosphate (OCP), as confirmed by PXRD, TEM, and SEM analysis of the formed precipitate. AOTAgNPs inhibited ACP transformation and OCP formation, at concentrations of 10 and 25 ppm. Furthermore, CitAgNPs at a concentration of 5 ppm promoted ACP transformation, but the effect on the composition of the obtained solid phase was not evidenced. No effect of PVPAgNPs on rate of transformation and precipitate composition was detected. The behaviour in the local environment was monitored by electron paramagnetic spectroscopy. SEM micrographs revealed that the best incorporation into CaPs was achieved for AOTAgNPs.

The obtained results provide new insights important for understanding CaPs formation on different nanomaterials.

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REFERENCES

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