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Interaction between bovine serum albumin and mesoporous silica nanoparticles functionalized with biopolymers

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ABSTRACT

Biomedical application of nanoparticles is largely associated to their fate in biological media which, in turn, is related to their surface properties. Surface functionalization plays a key role in determining biodegradation, cytotoxicity and biodistribution through interactions which may be mediated by the macromolecules occurring in biological media. A typical example is given by several proteins which lead to the formation of coated nanoparticles referred as protein corona. In this work we focus on mesoporous silica nanoparticles which, due to their intrinsic textural features, show potential as carriers for sustained drug release. Mesoporous silica nanoparticles functionalized by different biopolymers such as hyaluronic acid and chitosan were synthesized and characterized through small angle x-rays scattering, thermal analysis, and infrared spectroscopy. Biopolymer-coated mesoporous silica nanoparticles were used to investigate the interaction with bovine serum albumin, and to point out the role of different biopolymer coating. Gold-conjugated-bovine serum albumin was used to gain evidence on the occurrence of surface bound proteins enabling direct observation by transmission electron microscopy. Our findings provide insights on how different biopolymers affect the formation of a protein corona around functionalized mesoporous silica nanoparticles.

Keywords: Mesoporous silica nanoparticles, hyaluronic acid, chitosan, bovine serum albumin, protein corona, gold nano particles.