

pH-responsive protein delivery system based on large pore mesoporous silica

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Mesoporous silica have been used in delivery system because of their high surface area, large pore volume, tunable pore sizes.[1] Specifically, as siliceous mesocellular foam (MCF) particles have narrow window size distribution and ultra-large pore volume, they have been studied as a carrier for relatively large-sized guest molecules.[2] To enhance the therapeutic efficacy and to reduce adverse side effects of drugs, a target-specific drug-delivery system that can transport an effective dosage of drug molecules to the targeted cells and tissues on time is required.[3] Here, we describe pH-responsive protein delivery system using chitosan-coated MCF particles, which will allow environment-specific release of functional proteins in local tissues. Chitosan was conjugated on the surface of MCF particles via covalent and electrostatic routes. Although both conjugations showed a similar loading efficiency of guest molecules in MCF, MCF with covalently coated with chitosan led to obvious difference in release profiles between pH3 and pH7. When glucose oxidase (GOx) was loaded in MCF particles, gluconic acid produced from glucose lowered pH of the environment. This chitosan-coated MCF loaded with GOx can be used as glucose-responsive delivery of functional bioactive agents such as insulin.