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Nanobiocomposite for dual stimuli-responsive smart release of insulin using a novel high effective surface area functionalized gold nanoparticle-polypyrrole

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A novel functionalized gold nanoparticle-polypyrrole nanobiocomposite (PPyFGNP-NBC) was fabricated for electrical/pH dual stimuli-responsive local delivery of the hormone insulin. The fabrication method involves simple electrodeposition and immobilization processes without use of organic solvents. Carboxylated GNP, as hydrophilic branches, was used to achieving high loading efficiency for hydrophilic proteins and creating pH-sensitivity. Kinetics analysis showed that release of insulin strongly affected by applying external potential stimuli. Also, the release of insulin was under influence of pH and was slowed down under lower pH. This pH-sensitivity was remarkably increased by applying potential. *In-vitro* release study showed that under applied potential condition, release of insulin in the gastric juice is significantly slower than that in the intestinal fluid. So this smart protein delivery system protects insulin against harmful gastric environment while increases its release in the small intestine. It indicated that the PPy-FGNP-NBC is of potential for use in intelligent oral delivery system. Circular dichroism analysis showed that insulin retained its original conformation during electrochemically-stimulated loading and release.

Biography

Ehsan Shamaeli has completed his PhD from Tarbiat Modares University in Iran. He is pursuing a Post-doctoral program at Tarbiat Modares University conducting research after the completion of his Doctoral studies. He has published 6 papers in reputed journals.

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