

ADVANCED MATERIALS 2020: Development of chitosan coated calcium-alginate nanocapsules for oral delivery of liraglutide to diabetic patients - Fatemeh Shamekhi, Tarbiat Modares University, Tehran, Iran

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Abstract

Increasing prevalence, variable pathogenesis and natural history of progressive type II diabetes, highlight the necessity of immediate development of new therapeutic strategies. Glucagon-like peptide-1 receptor agonists are a new class of injectable antidiabetic drugs. Chitosan coated calcium-alginate nanocapsules were developed for oral sustained delivery of liraglutide, a long-acting analog of glucagon like peptide-1. The aim of such drug delivery system is to recover diabetic patient compliance which otherwise demands prolonged repeatedly injections. The effect of coating components including sodium alginate, calcium chloride and chitosan concentrations on the particle size was studied based on response surface methodology. The beads were characterized through dynamic light scattering (DLS), scanning and transmission electron microscopy (SEM and TEM) as well as fourier transform infrared spectroscopy (FTIR). It was shown that the diameter of the formed beads was most dependent on the encapsulation technique and alginate concentration. SEM revealed spherical and smooth particles of up to 100 nm diameter for optimum composition of alginate 0.5%, chitosan 0.5% and calcium chloride 0.5% in the ratio of 3:1:1. The resulting bead formulation had a loading efficiency of 92.5% and loading capacity of 54.16 %. In-vitro release studies in simulated gastrointestinal conditions were carried out in a sequential technique and the amount of drug release was found to be 39.1% after 8 hours. The MTT results of developed nanocarrier revealed up to 52.05% viability enhancement compared to free drug in 0.3 mg concentration. The results of this study demonstrated that chitosan coated calcium-alginate nanoparticles hold promise as a potential natural biodegradable polymer-based oral carrier of liraglutide for better management of diabetes.

Biography

Dr. Fatemeh Shamekhi has her expertise in encapsulation methods and optimization techniques of coating components for oral drug delivery. She had her specific focus on nanostructures and their characterization methods as well as their behavior through simulated gastrointestinal tract condition (in vitro models).

She has extensive experience in the academic field which extends to more than 10 years. She is currently a Lecturer at Azad University. She earned her Ph.D. degree in Nano-biotechnology from Tarbiat Modares University in 2018. Her master degree was in Enzyme Biotechnology from University Putra Malaysia. She published many peer-reviewed papers in Scopus indexed journals with impact factor as well as conference papers.

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