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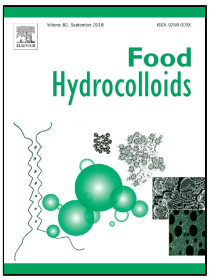

A novel polysaccharide gel bead enabled oral enzyme delivery with sustained release in small intestine

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A novel polysaccharide gel bead enabled oral enzyme delivery with sustained release in small intestine

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Abstract We report a novel oral delivery system based on sodium alginate/κ-carrageenan binary polysaccharide gel bead. β-galactase was selected as a model molecule to evaluate the capacity of the beads as delivery system. After enzyme encapsulation, the hydrogel beads were subsequently coated with κ-carrageenan (κ-CG) and ε-polylysine (ε-PL). Scanning electron microscope (SEM) images revealed the microstructural differences between the beads synthesized with and without ε-PL coating. Fourier transform infrared spectroscopy (FTIR) spectra further proofed the successful coating of ε-PL and κ-CG. Releasing studies showed that the enzyme releasing time is significantly prolonged by ε-PL coating. In vitro experiments showed that, the hydrogel beads synthesized with 0.6% ε-PL were stable and compact in the simulated gastric fluid environment with negligible swelling, which can protect the loaded enzyme effectively. More than 94.6% lactase activity can be retained after treated with simulated gastric fluid (pH 4) for 2 hours. After transferred into simulated small intestinal fluid for 14 hours (pH 7.4), as much as 89.6% of the enzyme can be released from the beads. It is worthy to note that the activity of the released enzyme retained 76.0% of total enzyme activity. These unique properties of the hydrogel beads enabled the effectively maintenance of enzyme bioactivity and thus enhanced the enzyme delivery and therapeutic efficiency. The reported delivery system is