In vitro permeability enhancement of curcumin across Caco-2 cells monolayers using electrospun xanthan-chitosan nanofibers

Xanthan-Chitosan (X-Ch) polysaccharides nanofibers were prepared using electrospinning processing as an encapsulation and delivery system of curcumin (Cu). The X-Ch-Cu nanofibers remained stable in aqueous HBSS medium at pH 6.5 and pH 7.4, mainly due to the ability of oppositely charged xanthan-chitosan polyelectrolytes to form ionically associated electrospun nanofibers. The xanthan-chitosan-curcumin nanofibers were incubated with Caco-2 cells, and the cell viability, transepithelial transport and permeability properties across cell monolayers were investigated. After 24 h of incubation, the exposure of Caco-2 cell monolayers to X-Ch-Cu nanofibers resulted in a cell viability of ~80%. A 3.4-fold increase of curcumin permeability was observed when the polyphenol was loaded into X-Ch nanofibers, compared to the free curcumin. This increased in vitro transepithelial permeation of curcumin without compromising cellular viability was induced by interactions upon contact between the nanofibers and the Caco-2 cells, leading to the opening of the tight junctions. The results obtained revealed that X-Ch nanofibers can be used for oral delivery applications of poorly water-soluble compounds at the gastrointestinal tract.