Bioactive protein-based nanofibers interact with intestinal biological components resulting in transepithelial permeation of a therapeutic protein - DTU Orbit (18/04/2019)

Bioactive protein-based nanofibers interact with intestinal biological components resulting in transepithelial permeation of a therapeutic protein.

Proteins originating from natural sources may constitute a novel type of material for use in drug delivery. However, thorough understanding of the behavior and effects of such a material when processed into a matrix together with a drug is crucial prior to further development into a drug product. In the present study the potential of using bioactive electrospun fish sarcoplasmic proteins (FSP) as a carrier matrix for small therapeutic proteins was demonstrated in relation to the interactions with biological components of the intestinal tract. The inherent structural and chemical properties of FSP as a biomaterial facilitated interactions with cells and enzymes found in the gastrointestinal tract and displayed excellent biocompatibility. More specifically, insulin was efficiently encapsulated into FSP fibers maintaining its conformation, and subsequent controlled release was obtained in simulated intestinal fluid. The encapsulation of insulin into FSP fibers provided protection against chymotrypsin degradation, and resulted in an increase in insulin transport to around 12% without compromising the cellular viability. This increased transport was driven by interactions upon contact between the nanofibers and the Caco-2 cell monolayer leading to the opening of the tight junction proteins. Overall, electrospun FSP may constitute a novel material for oral delivery of biopharmaceuticals.

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