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Application of chitosan/fucoidan nanoparticles in oral delivery system

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In designing an effective oral delivery system, the harshness of the gastrointestinal tract is a key limitation. Therefore, developing a pH-responsive carrier is crucial. We developed novel chitosan/fucoidan nanoparticles (CS/F NPs) using a simple polyelectrolyte self-assembly method and evaluated their potential to be oral delivery carriers. As the CS/F weight ratio was 1/1, the CS/F NPs were spherical and approximately 380nm, revealing significant pH-sensitive properties. The iso-electric point of the CS/F NPs was 5.7. Using gamma scintigraphy, the ^{99m}Tc-methylene diphosphonate encapsulated CS/F NPs were quite stable at pH 2.5 and decomposed at pH 7.4. For long-term storage, trehalose (20% w/v) is a suitable cryoprotectant. The outcome of the trans-epithelial electric resistance (TEER) of the Caco₂ monolayer shows that CS/F NPs effectively enhanced the opening of the cell tight junction. The CS/F NPs also exhibited highly potent antioxidant effects by scavenging 1, 1-diphenyl-2-picrylhydrazyl (DPPH) reducing the concentration of intracellular reactive oxygen species (ROS) and superoxide anion (O²⁻) in stimulated macrophages. The DPPH scavenging effect of CS/F NPs primarily derives from fucoidan. These CS/F NPs activated no host immune cells into inflammation-mediated cytotoxic conditions induced by IL-6 production and NO generation. Gentamicin (GM) an antibiotic was used as a model drug for an *in vitro* releasing test. The CS/F NPs controlled the release of GM for up to 72 hours with 99% of release. In conclusion, the pH-responsive CS/F NPs with anti-oxidative properties are promising carriers for an oral delivery system.

Biography

Yi Cheng Huang completed her BS and MS in Chemistry in National Tsing Hua University and PhD in Biomedical Engineering at National Taiwan University. Her research interests are using marine resources such as chitosan and fucoidan for nano-carriers development and tissue regeneration. She was supported by the Ministry of Science and Technology, Taiwan to conduct her researches and has published more than 20 papers in reputed journals and got 6 patents.

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