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Cyclic oligosaccharide modification of lanthanide-doped upconversion nanoparticles: As novel nanostructural drug carriers via host-guest interactions

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Statement of the Problem: Carbohydrates are biological macromolecules involved in life activities, not only providing energy and intracellular tissue support, but also mediating the occurrence of inflammatory reactions, affecting cell growth, division, differentiation, and transduction of intercellular cell signaling. However, low targeted delivery and lack of fluorescent labeling are two major problems with natural polysaccharide (GA) drugs. The purpose of this study is to describe the experience of designing a unique pH-sensitive drug carrier based on host-guest interaction between rhodamine and β-cyclodextrin. This strategy can be extended to other pH-sensitive drug delivery system. Methodology & Theoretical Orientation: UCNPs were synthesized following Chemical protocol. Rhodamine was conjugated with Ganoderma applanatum polysaccharide (GAP) through reductive amination reaction to form rhodamine polysaccharide complex (R-GAP). The cytotoxicity of CD-UCNPs and R-GAP-CD UCNPs was examined using a methyl thiazolyl diphenyl tetrazolium (MTT) assay. Findings: The UCNPs were synthesized using a typical solvothermal method and UCNPs were modified with β-CD to form a water-solubility nanocarrier. Rhodamine was conjugated with GAP through reductive amination reaction to form R-GAP so that it makes the GAP fluorescently trackable. R-GAP was loaded on CD-UCNPs and estimated the drug loading and releasing behaviors. The results revealed that it was a good pH-sensitive drug carrier and the maximum release amounts of R-GAP reach up to 67.2% after incubated in PBS for 36 h at pH 5.5. Conclusion & Significance: The strategy described in this work is simple and effective to fluorescently mark the GAP and can enhance the targeting delivery. This article give an evidence to improve natural polysaccharide antitumor drug efficiency by a proper modifications.

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