Polysaccharide/DOCA conjugates: Physicochemical characterization, anti-cancer drug-release, *in vivo* fate

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The objective of this study was to develop new self-organized nanogels as a means of drug delivery in patients with cancer. Pullulan (PUL) and deoxycholic acid (DOCA) were conjugated through an ester linkage between the hydroxyl group in PUL and the carboxyl group in DOCA. Three types of PUL/DOCA conjugates were obtained, differing in the number of DOCA substitutions (DS; 5, 8, or 11) per 100 PUL anhydroglucose units. The physicochemical properties of the resulting nanogels were characterized by dynamic light scattering, transmission electron microscopy, and fluorescence spectroscopy. The mean diameter of DS 11 was the smallest (approx 100 nm), and the size distribution was unimodal. To determine the organizing behavior of these conjugates, we calculated their critical aggregation concentrations (CACs) in a 0.01-M phosphate buffered saline solution. They were 10.5×10^{-4} mg/mL, 7.2×10^{-4} mg/mL, and 5.6×10^{-4} mg/mL for DS 5, 8 and 11, respectively. This indicates that DOCA can serve as a hydrophobic moiety to create self-organized nanogels. To monitor the drug-releasing behavior of these nanogels, we loaded doxorubicin (DOX) onto the conjugates. The DOX-loading efficiency increased with the degree of DOCA substitution. The release rates of DOX from PUL/DOCA nanogels varied inversely with the DS. We concluded that the PUL/DOCA nanogel has some potential for use as an anti-cancer drug carrier because of its low CAC and satisfactory drug-loading capacity.