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PREPARATION AND CHARACTERIZATION OF POLYOXYTHYLATED TERT-BUTHYLCALIX[4]ARENE NANOPARTICLES AS PLATFORMS FOR DELIVERY OF CURCUMIN

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The contribution is focused on newly-synthetized octopus-shaped macromolecules, consisting of hydrophobic calix[4]arene core and four arms of hydrophilic poly(ethylene oxide) chains as platform for delivery of hydrophobic agent curcumin. Due to their amphiphilic nature, polyoxyethylated calyx(4)arenes (CX[4]PEG) can self-associate in water by forming well-defined spherical nanoparticles. At concentration below the CMC, CX[4]PEG drastically increased curcumin solubility by formation of inclusion complexes with high stability constant (Kc). A significantly higher solubility enhancement of curcumin was observed at concentration exceeding the critical micellar concentration, attributed with additional solubilization of curcumin into the hydrophobic domains of the supramolecular aggregates by non-covalent interactions. The curcumin:CX[4]PEG inclusion complexes as well as curcumin loaded polyoxyethylatedtert-buthylcalix[4]arene supramolecular aggregates were prepared using two methods: heating method and solvent-evaporation method. Physicochemical characteristics of the nanoparticles (size, size distribution and zeta potential were evaluated by DLS and the results revealed particles of app.180 nm with monomodal distribution (PDI below 0.2) and zeta potential of – 20 mV suitable for systemic application. The in vitro curcumin release profiles from supramolecular CX[4]PEG aggregates were studied under simulated physiological conditions for different incubation periods from 2, 4, 6, 8, 10 and 24 hours. The results showed initial burst release of curcumin, followed by slower drug release. These findings give us a reason to consider polyoxyethylatedtert-buthylcalix[4]arene nanoparticles as promising platforms for drug delivery.

Keywords: curcumin, CMC, CX[4]PEG, nanoparticles, delivery, Kc