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# Designing and synthesis of cyclodextrin based dual-responsive supramolecular drug delivery network

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Novel drug delivery systems including supramolecular networks exhibit a number of advantages over the conventional drug delivery methods. Among them, the unique structural and functional diversity of supramolecular networks make them a synthetically tunable potential drug delivery system for a broad range of applications. Further, biocompatible, water soluble β-cyclodextrin (β-CD) has frequently been utilized in supramolecular networks because the hydrophobic cavity of β-CD facilitates the inclusion complex formation with cavity-size compatible, wide variety of 'guests'. This research study was focused on the designing, synthesis and inclusion complex formation study of building blocks which can be utilized for the preparation of cyclodextrin based dual-responsive supramolecular drug delivery network. The synthetic scheme of this research project was designed to obtain a supramolecular network via the inclusion complex formation among terminal benzoyl/ naphthoyl groups of linear shape 'guest', building block 1 (BB1) and the terminal β-CD groups of branched shape 'host', building block 2 (BB2). The resulting supramolecular network can be disassembled via breaking the host-guest complex and the ester bonds in building blocks by two stimuli, acidic pHs and esterase enzyme, respectively. Two types of BB1, BB1a and BB1b which have benzoyl and naphthoyl groups, respectively at the both ends were synthesized using the esterification reaction between tetraethylene glycol with benzoic acid or naphthoyl chloride. The BB2 was designed to synthesize using the esterification between glycerol and carboxy-β-CD. The oxidation of primary alcohol group of β-CD yields a starting material, carboxy-β-CD for the BB2 synthesis. The thin layer chromatography (TLC) and preparative TLC were performed on crude mixtures as required for the identification and separation, respectively. Further, the synthesis of building blocks BB1a, BB1b and carboxy-β-CD were confirmed using TLC, Fourier transform infra-red spectroscopy and UV-visible (UV-vis) spectroscopy. The red shift observed in the UV-vis spectra of the crude carboxy-β-CD with BB1a or BB1b confirmed the inclusion complex formation. Further, UV-vis studies confirmed that crude carboxy-β-CD binds with BB1b stronger than BB1a. The separation and purification of carboxy-β-CD from the crude mixture and the completion of the synthesis of BB2 are currently being carried out.