

Amphiphilic Chitosan Based Solubilisers

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A series of amphiphilic polymers were synthesized by hydrophobic modification of glycol chitosan with hexadecyl bromide and subsequent quaternization of amino-groups with methyl iodide. The aggregation of these water soluble amphiphilic chitosan derivatives (GCHQ) in aqueous media was evaluated by monitoring the hypsochromic shift in the absorbance of methyl orange (observed when this probe is moved to the non polar environment of the aggregated polymer). The hypsochromic shift of methyl orange as well as the critical aggregation concentration (CAC) of GCHQ is a complex function of molecular weight with more hydrophobic aggregates found in polymers of high (28 – 261kD, due to physical cross-linking) and low (<15kD, due to the formation of tighter aggregates) molecular weight. The medium molecular weight polymers (19 – 22kD) form more hydrophilic and looser aggregates. The size of the micelles in aqueous solutions was evaluated by photon correlation spectroscopy and aggregate size was found to increase with an increase in molecular weight.

A linear correlation between the CAC/aggregate hydrophilicity and the hydrophilicity of the polymers as estimated by the hydrophilic index (HI - level of quaternary ammonium groups/level of hexadecyl groups) was found within each molecular weight class. An increase in HI leads to an increase in the polarity of the hydrophobic domains within the polymeric micelles.

Solubilisation of prednisolone in aqueous solutions of GCHQ has been studied. The maximal solubilisation (0.54 mg/mL) is observed in solutions of amphiphilic polymers with higher HI values and within the 19-22 kD molecular weight class. As expected a further increase in polymer molecular weight decreases the solubilising ability of the polymers.