Design and Emulsifying Properties of Amphiphilic Glycopolymer Synthesized by Controlled Polymerization

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For biomedical applications the use of biocompatible and possibly biodegradable compounds is fundamental. In this respect, polysaccharides and their derivatives are excellent candidates, due to their natural origins and the specific interactions between sugars and cell surface receptor proteins (lectins). Thus, amphiphilic dextran derivatives in particular present interesting surfactant and self-assembly properties (1-2) which can be exploited in many medical and pharmaceutical applications or used as emulsion stabilizers for food or cosmetics applications. Until recently, these hydrophobic polysaccharide derivatives have been mainly obtained by covalently grafting hydrophobic moieties like phenoxy-substitued dextran (2). On the contrary, the amphiphilic grafted derivatives of dextran called glycopolymers have been less studied in terms of surfactant activity (3).
Recently, novel comb-like glycopolymers with well defined architecture have been developed at the LCPM, by the 'grafting from' strategy. These polylactide-grafted dextran (dex-g-PLA) glycopolymers combine a hydrophilic dextran backbone with hydrophobic polylactide grafts. Using a three-step strategy, lactide polymerization was initiated from macroinitiators derived from dextran to synthesize glycopolymers (4), with varying architecture (length and grafting density of PLA moieties/ length of the dextran backbone). Depending on the mass ratio of PLA, they are either water- or oil- soluble but they all display the capacity to self-organize at interfaces or in solution. Using the same strategy, current work has been focusing on the synthesis by ATRP of amphiphilic copolymers of dextrane-g-poly(methyl-methacrylate) (dex-g-PMMA), with controlled macromolecular architecture. Further studies have been made on such glycopolymers especially dex-g-PLA to evaluate the emulsifying ability of these totally degradable polylactide-grafted dextrans.
This contribution depicts the synthesis of amphiphilic glycopolymers with a particularly emphasis on the control of their macromolecular parameters. The emulsifying properties of previous copolymers will be evidenced though the preparation and the stabilization of submicronic emulsions. Finally amphiphilic glycopolymers will be used as stabilizers of inverse miniemulsion polymerization.

References

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