Block Copolymers for Controlled Drug Delivery

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Abstract

Over recent years, there has been significant interest in the study of block copolymers, in particular regarding their potential as drug delivery agents. Pluronic triblock copolymers tend to micellise in aqueous solution to form aggregates consisting of a hydrophilic corona of PEO, and a hydrophobic core of PPO within which drugs can be solubilised and transported, creating potential for controlled release in the body. The micellar structures of different Pluronics are well characterised, and show a strong dependence on factors such as polymer composition, concentration, temperature and cosolvents. However, relatively few studies have investigated the change in micellar structure of Pluronic micelles on uptake of drug molecules. This is crucial in understanding the release profiles *in vivo*, since the size and aggregation number of the micelles is critical in determining blood circulation times and bioavailability of the drug, as well as the maximum amount of drug which can be solubilised.

We describe the use of small-angle neutron scattering and diffusion NMR to investigate the structural changes in a series of Pluronics on addition of ibuprofen. The effect of drug concentration and sample temperature on the structures has also been considered, and by determining the change in properties such as aggregation number, micelle size and fraction of polymer micellised on addition of drug, it is possible to gain insight into polymer-drug interactions and potential drug release characteristics of the polymers.