

Association Behavior of Biotinylated and Non-Biotinylated PolyEthylene Oxide-*b*-Poly(2-(Diethylamino)Ethyl Methacrylate)

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Abstract – Biotinylated and non-biotinylated copolymers of ethylene oxide (EO) and 2-(diethylamino)ethyl methacrylate (DEAEMA) were synthesized by the atom transfer radical polymerization technique (ATRP). The chemical compositions of the copolymers as determined by NMR are represented by PEO₁₁₃PDEAEMA₇₀ and biotin-PEO₁₀₄PDEAEMA₉₃ respectively. The aggregation behavior of these polymers in aqueous solutions at different pHs and ionic strengths was studied using a combination of potentiometric titration, dynamic light scattering (DLS), static light scattering (SLS), and transmission electron microscopy (TEM). Both PEO-*b*-PDEAEMA and biotin-PEO-*b*-PDEAEMA diblock copolymers form micelles at high pH with hydrodynamic radii (R_h) of about 19 and 23 nm, respectively. At low pH, the copolymers are dispersed as unimers in solution with R_h of about 6-7 nm. However, at a physiological salt concentration (c_s) of about 0.16M NaCl and a pH of 7-8, the copolymers form large loosely packed Gaussian chains, which were not present at the low c_s of 0.001M NaCl. The critical micelle concentrations (CMC) and the cytotoxicity of the copolymers were investigated to determine a suitable polymer concentration range for future biological applications. Both PEO-*b*-PDEAEMA and biotin-PEO-*b*-PDEAEMA diblock copolymers possess identical CMC values of about 0.0023 mg/g, while the cytotoxicity test indicated that the copolymers are not toxic up to 0.05mg/g (> 83% cell survival at this concentration).