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POLYELECTROLYTE ASSOCIATION WITH MODEL BIOLOGICAL MEMBRANE

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The use of amphiphilic block copolymers as agents to modify cell membrane structure and function has been an area of increasing research interest. Of particular interest have been commercially available amphiphilic triblock copolymers of PEO_n-PPO_m-PEO_n. Numerous investigations have explored their use in a wide range of biomedical applications, including modifiers in drug delivery, in-situ generated implants, gene expression, synthetic chaperones, barriers against bacterial adsorption, neuroprotective and restorative agents, and soft tissue injury treatment (including stroke and electrical / thermal burns). Comparatively less effort has been directed at studying the use of polyelectrolytes in the field of cell membrane repair. In this presentation we present our recent work directed at the synthesis of polyanionic and polycationic polymers and their association with artificial biological membranes. Poly(acrylic acid). PAA, is a well known polyelectrolyte that responds to changes in pH by altering its physical conformation. Specifically, at low pH, when the carboxylic acid groups are neutral, the polymer exists in a compact coiled state. At high pH electrostatic repulsions, due to the deprotonation of carboxylic acids and an increase of charge along the polymer length, cause polymer expansion. Small angle X-ray scattering was used to determine PAA homopolymer conformational state at various pH values upon dispersal in buffered aqueous solution. These studies were compared to those carried out in the presences of a lipid bilayer. The scattering patterns show not only changes in homopolymer assembly but also changes in altered bilayer roughness and rigidity due to association with the bilayer. Identical measurements carried out using a PAA-lipid conjugate clearly indicate that the two different forms of PAA behave differently in both bulk aqueous media and in the presences of a lipid bilayer. This work lays the groundwork for future studies that will be required to develop a fuller understanding of how polyelectrolytes could be designed to target the treatment of a particular disease or injury.

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