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Surface Functionalized Biodegradable Polymersome for Targeted Drug Delivery

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Abstract : In recent years' polymersomes, self-assembled polymeric vesicles emerge from block copolymers, have been widely investigated due to their enhance stability and unique advantageous properties compared to their phospholipid counterpart, liposomes, dendrimers, and micelles. It provides a distinctive platform for advanced therapeutics and the creation of complex (bio) catalytically active systems for research in Nanomedicine and synthetic biology. Inspired by nature, where compartmentalization of biological components is all ubiquitous, we are interested in developing a platform technology of self-assembled multifunctional compartments with applications in areas from targeted drug/gene delivery, biosensing, pharmaceutical to cosmetics. Polymersome surfaces can be a proper choice of derivatization with a controlled amount of functional groups. To achieve site-specific targeting of polymersomes, biological recognition motives can be attached to the polymersomes surface by standard bioconjugation techniques, (like esterification, amidation, thiol-maleimide coupling, click-chemistry routes or other coupling methods). Herein, we are developing easy going, one-step bioconjugation strategies for site-specific surface functionalized biodegradable polymeric and/or polymer-lipid hybrid vesicles for targeted drug delivery. Biodegradable polymer, polycaprolactone-b-polyethylene glycol (PCL-PEG), polylactic acid-b-polyethylene glycol (PLA-PEG) and phospholipid, 1-palmitoyl-2- oleoyl-sn-glycero-3-phosphocholine (POPC) has been widely used for numerous vesicle formulations. Some of these drug-loaded formulations are being tested on mice for controlled release. These surface functionalized polymersomes are also appropriate for membrane protein reconstitution/insertion, antibodies conjugation and various bioconjugation with diverse targeted molecules for controlled drug delivery.

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