Characterization of Self Assembled Hybrid Siloxane-phosphocholine Bilayers

Brett W. Rickeard,[a] Mark B. Frampton,[b,c] Michael H. L. Nguyen,[a] Mitchell DiPasquale,[a] Drew Marquardt [a] and Paul M. Zelisko,[b,c]

[a] Department of Chemistry and Biochemistry, University of Windsor, Windsor, Ontario
[b] Department of Chemistry and Centre for Biotechnology, Brock University, St. Catharines, Ontario
[c] Advanced Biomanufacturing Centre, Brock University, St. Catharines, Ontario

Liposomes have been recognized as an ideal drug delivery system due to their amphiphilic properties, allowing the entrapment of both hydrophobic and hydrophilic drugs. Liposomal drug delivery systems are typically composed of phospholipids, which are biocompatible and have a low toxicity, making them ideal for drug delivery arrangements.

Phospholipids are amphiphilic, and it is this characteristic that is the driving force behind the formation of supramolecular aggregates when they are dispersed in water. These supramolecular aggregates can take on two different formsn multilamellar vesicles (MLVss) and unilamellar vesicles (ULVss). MLVss can be forced into ULVss via extrusion and other layer shedding methods. Previously, siloxane surfactants have shown similar self- assembly properties to phospholipids in solution.[2,3] We have examined the self-assembly properties of newly synthesized siloxane phsophocholines (SiPCs) when subjected to an aqueous environment. Using small angle X-ray scattering (SAXS) we characterized the bilayer structure and aggregate morphology of the SiPCs. The different SiPC hybrid lipids showed different self-assembly properties which correlates to the relative volume of the disiloxane portion relative to the total volume of the alkyl chains in the fatty acid residue. We found that SiPCs with a fatty acid chain between C_8 – C_{14} units in length in the *sn*-1 position, with a fve carbon-terminated pentamethyldisiloxane fatty acid in the sn-2 position, results in the formation of unilamellar vesicles. Elongating the fatty acid chain to a length of C_{16} and C_{18}, but keeping the sn-2 position the same, resulted in the formation of both unilamellar and multilamellar vesicles. We hypothesize that the formation of the unilamellar vesicles in not only driven by the hydrophobic effect, but also the oleophobic effect conveyed by the siloxane chain.

References

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