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AN IMIDAZOLE-CONTAINING NOVEL CATIONIC SURFACTANT

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Abstract: Vesicles formed by cationic surfactants are used for gene and drug delivery and recently for vaccines. Imidazole-derived surface-active ionic liquid derivatives have many applications in nanotechnology and biotechnology (1). Here we synthesized and characterized a novel cationic surfactant containing an imidazolium head group and two alkyl chains and compared it with a similar compound. 1,3-Di-hexadecyl-imidazolium chloride (DHImC) was synthesized and characterized. Dihexadecyldimethyl-ammonium chloride (DHDAC) was prepared by ion exchange from commercial DHDAB. 4-trimethylammonium-2,2,6,6-tetramethylpiperidine-1-oxyl iodide (CAT) was encapsulated in SUVs of both surfactants in 5 mM NaCl (extruded with 100 nm pore membrane). EPR spectra for 5-MeSL and 16-MeSL (Methyl n-DOXYL-stearate) were incorporated in the surfactant bilayer. Differential Scanning Calorimetry determined transition temperatures (Tc). Optical Microscopy images were obtained for Giant Unilamellar Vesicles (GUVs). The Tc´s were: 30.1 ^{0}C (DHDAC) and 48.7 °C (DHImC). CAT-EPR spectra of SUVs, recorded after adding Ascorbic Acid (AA), showed a stable residual EPR signal attributed to aqueous core-entrapped CAT. 5- and 16- MeSL spin labels showed a more ordered region closer to the polar head (5-MeSL) and a less ordered region at the hydrophobic core of the bilayer (16-MeSL). The mobilities at different temperatures reflected a gel phase before the Tc. Optical Microscopy images also showed a clear difference in vesicle organization before and after the transition temperature. **Conclusions**. DHImC forms stable vesicles with an aqueous inner compartment. DHDAC and DHImC, characterized by EPR, showed differences in mobility along the bilayer and Tc´s. The remarkable differences in Tc´s for surfactants with the same alkyl chain size can be explained by the the π–π head group interactions on the imidazolium compounds. DHImC vesicles constitute a novel and potentially useful delivery system.

Key-words: Imidazol-surfactant, Micelles, bilayer
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References:
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