Effects of Proteoliposome Composition and Draw Solution Types on Separation Performance of Aquaporin-Based Proteoliposomes - DTU Orbit (28/12/2018)

**Effects of Proteoliposome Composition and Draw Solution Types on Separation Performance of Aquaporin-Based Proteoliposomes: Implications for Seawater Desalination Using Aquaporin-Based Biomimetic Membranes**

Aquaporins are a large family of water transport proteins in cell membranes. Their high water permeability and solute rejection make them potential building blocks for high-performance biomimetic membranes for desalination. In the current study, proteoliposomes were prepared using AquaporinZ from Escherichia coli cells, and their separation properties were characterized by stopped-flow measurements. The current study systematically investigated the effect of proteoliposome composition (lipid type, protein-to-lipid ratio (PLR), and the addition of cholesterol) on water permeability and NaCl retention. Among the various lipids investigated, 1,2-dioleoyl-sn-glycero-3-phosphocholine (DOPC)-based proteoliposomes were found to have excellent osmotic water permeability and NaCl reflection coefficient values. Increasing the PLR of DOPC proteoliposomes up to 1:200 increased their osmotic water permeability. However, further increase in the PLR reduced the osmotic water permeability probably due to the occurrence of defects in the proteoliposomes, whereas the addition of cholesterol improved their osmotic water permeation likely due to defects sealing. The current study also investigated the effect of major dissolved ions in seawater (e.g., Mg2+ and SO42−) on the stability of proteoliposomes, and design criteria for aquaporin-based biomimetic membranes are proposed in the context of desalination.

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