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Effect of cold plasma on the characteristics of DPPC liposomes

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Recent progress in atmospheric plasmas has led to the creation of cold non-thermal atmospheric plasma (CAP). CAP is an ionized gas that has tremendous applications in biomedical engineering and is used as a possible therapy in dentistry and oncology. The aim of plasma interaction with tissue is not to denature the tissue, but rather to operate below the threshold of thermal damage and to induce chemically specific response or modification. Liposomes are used as models for artificial cells. This report therefore investigates the effect of cold plasma on 2-dipalmitoyl-sn-glycero-3-phosphocholine (DPPC) liposomes prepared by thin film hydration method which are used as a model for lipid bilayer membrane. DPPC liposomes were exposed to cold plasma 2, 3 and 5 minutes, respectively. The effect of cold plasma on DPPC characterization parameters such as size, charge, FTIR absorption spectrum, UV spectrum and phase transition temperature were investigated. The present study revealed that CAP could alter the molecular structure for DPPC liposomes as depicted in the change in the FTIR absorption peaks at 3439 and 1687 cm-1. In addition, CAP affected the phase transitions for the DPPC by shifting it to higher temperatures. Moreover, CAP led to the increase of DPPC liposome size. 2 min exposure to CAP resulted in rapid coagulation of liposomes as depicted from the low zeta potential value obtained. However, the UV absorption spectrum for DPPC liposomes was not altered by CAP exposure. Hence, this work highlighted that CAP may modify the physical and chemical characteristics of DPPC liposomes.

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