Influence of Counterions on the Interaction of Pyridinium Salts with Model Membranes

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The interaction of pyridinium salts (PS) with red blood cells and planar lipid membranes was studied. The aim of the work was to find whether certain cationic surfactant counterion influence its possible biological activity. The counterions studied were Cl^-, Br^-, I^-, ClO_4^-, BF_4^- and NO_3^-. The model membranes used were erythrocyte and planar lipid membranes (BLM). At high concentration the salts caused 100% erythrocyte hemolysis (C_{100}) or broke BLMs (CC). Both parameters describe mechanical properties of model membranes.

It was found that the efficiency of the surfactant to destabilize model membranes depended to some degree on its counterion. In both, erythrocyte and BLM experiments, the highest efficiency was observed for Br^-, the lowest for NO_3^-. The influence of all other anions on surfactant efficiency changed between these two extremities; that of chloride and perchlorate ions was similar. Some differences were found in the case of BF_4^- ion. Its influence on hemolytic possibilities of PS was significant while BLM destruction required relatively high concentration of this anion. Apparently, the influence of various anions on the destructive action of PS on the model membrane used may be attributed to different mobilities and radii of hydrated ions and hence, to different possibilities of particular anions to modify the surface potential of model membranes. This can lead to a differentiated interaction of PS with modified bilayers. Moreover, the effect of anions on the water structure must be taken into account. It is important whether the anions can be classified as water ordering kosmotropes that hold the first hydration shell tightly or water disordering chaotropes that hold water molecules in that shell loosely.