Diacyl aminoacid/Diacyl phospholipid mixtures: catanionic and cationic vesicles

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Amino acid based surfactants frequently show new and interesting self aggregation properties which can be explained by consideration of their relatively complex head group structures. In this communication we will detail some of the aspects of the formation of pseudotetra-chain catanionic mixtures with phospholipids [1] as well as on the adsorbed and spread monolayers on aqueous subphases [2]. Concerning the catanionic mixtures of 1,2-dimyristoyl-rac-glycero-3-O-(Nα-acetyl-L-arginine) hydrochloride (1414R Ac) with 1,2-dipalmitoyl-sn-glycero-3-phosphate monosodium salt (DPPA), vesicle size and zeta potential were measured at several mixing ratios. Additional information on counterion binding, vesicle size, and integrity was obtained from ion selective electrode and Cryo-TEM measurements. Addition of positively charged surfactants to DPPA results in an increase of vesicle size. However, zeta potential shows different trends, depending on whether water or acid media are used as solvent. In the latter zeta potential values progressively approach zero upon addition of amino acid based surfactants. In water, surprisingly, zeta potential values become more negative. Concerning the mixtures with zwitterionic double chain compounds, DPPC (1,2-dipalmitoyl-sn-glycero-3-phosphatidylcholine), the dynamic surface tension of 1414RAc/DPPC aqueous dispersions injected into the saline subphase was followed by tensiometry. The layer formation for the mixtures is always accelerated with respect to DPPC and, surprisingly, the surface tension reduction is faster and reaches lower surface tension values at surfactant concentration below its cmc. Interfacial dilational rheology properties of mixed films spread on the air/water interface were determined by the dynamic oscillation method using a Langmuir trough. The monolayer viscoelasticity shows a non-ideal mixing behaviour with predominance of the surfactant properties. This non-ideal behaviour has been attributed to the prevalence of electrostatic interactions. The physical and biological [3-4] properties of these systems make them good candidates for special drug delivery needs.