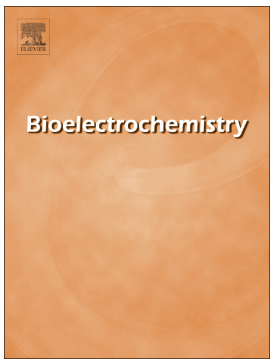

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Copper - phospholipid interaction at cell membrane model hydrophobic surfaces

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Abstract

Detailed investigation of Cu (II) binding with natural lipid phosphatidylglycerol (PG) in aqueous solution was carried out by voltammetric measurements at the mercury drop electrode, complemented by monolayer studies in a Langmuir trough and electrophoretic measurements, all used as models for hydrophobic cell membranes. Penetration of copper ions into the PG layer was facilitated by the formation of hydrophilic Cu-Phenanthroline (Phen) complex in the subphase, followed by the mixed ligand Cu-Phen-PG complex formation at the hydrophobic interface. Electrophoretic measurements indicated a comparatively low abundance of the formed mixed ligand complex within the PG vesicles, resulting it the zeta potential change of +0.83 mV, while monolayer studies confirmed their co-existence at the interface. The Cu-Phen-PG complex was identified in the pH range from 6 to 9. The stoichiometry of the complex ([PhenCuOHPG]), as well as its stability and kinetics of formation, were determined at the mercury drop electrode. Cu-Phen-PG reduces quasireversibly at about -0.7 V *vs*. Ag/AgCl including reactant adsorption, followed by irreversible mixed complex dissociation, indicating a two-electron transfer - chemical reaction (EC mechanism). Consequently, the surface concentration (γ) of the adsorbed [PhenCuOHPG] complex at the hydrophobic electrode surface was calculated to be $(3.35 \pm 0.67) \times 10^{-11}$ mol cm^{-2}. Information on the mechanism of Cu (II) - lipid complex formation is a significant contribution to the understanding of complex processes at natural cell membranes.