

Interaction of plant alkaloid, berberine, with zwitterionic and negatively charged phospholipid bilayers

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Berberine exhibits many pharmacological activities e.g. antibacterial, anti-inflammatory, antiproliferative and apoptosis-inducing. Interaction of berberine with model membranes was studied for the first time using differential scanning calorimetry, fluorescence spectroscopy and turbidity measurements. Influence of berberine on thermotropic properties of bilayers formed from zwitterionic DMPC was insignificant, whereas in bilayers formed from negatively charged DMPG berberine reduced the temperature and cooperativity of main phospholipid phase transition. In higher concentrations berberine induced complex double-peak transition, with the new peak appearing in temperature higher than the original one. It suggested the interaction of the alkaloid with lipid headgroup region of the bilayer. Additionally, berberine quenched fluorescence of Prodan to a higher extent than Laurdan that pointed to stronger interaction with membrane segments close to its surface. Berberine-induced fluorescence quenching of both probes was more pronounced in DPPG than in DPPC bilayers. It was concluded that electrostatic interactions governed berberine association with model membrane.