



Langmuir monolayers containing ibuprofen and phospholipids

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Abstract – A study is presented of the interaction between ibuprofen (IBU) and dipalmitoyl phosphatidyl choline (DPPC) or dipalmitoyl phosphatidyl glycerol (DPPG) monolayers as simple membrane models. The monolayer properties were studied using surface pressure and surface potential measurements, Brewster angle microscopy (BAM) and polarization modulation infrared reflection-absorption spectroscopy (PM-IRRAS). IBU had little effect on surface pressure/molecular area isotherms in monolayers of DPPG but greatly increased the mean molecular area of DPPC.

Interactions of amphiphilic drugs with cell components involve changes in the organization of the biological membrane, which may be mimicked in a simplified way with phospholipid monolayers [1]. Here, a study is presented of the interaction between ibuprofen, an anti-inflammatory drug, and phospholipid monolayers as simple membrane models. Surface pressure and surface potential isotherms were obtained for mixed Langmuir monolayers of either dipalmitoyl phosphatidyl choline (DPPC) or dipalmitoyl phosphatidyl glycerol (DPPG) (0.5 mg/mL) co-spread with ibuprofen at distinct concentrations, viz. 0.5, 1, 2, 3, 4 and 5% in mol. The morphology of the films was studied with a Brewster angle microscope, while the interactions between ibuprofen and the phospholipid membrane were probed with PM-IRRAS experiments.

The isotherms of the DPPG/ibuprofen and DPPC/ibuprofen monolayers were more expanded than neat DPPG or DPPC monolayers, with a larger effect observed for DPPC. The incorporation of ibuprofen also affected the surface potential that became positive with the alignment of the hydrophobic tails and the positive polar head at high pressures. The BAM images showed the formation of aggregates in the monolayers of DPPG-ibuprofen, which is also reflected in the irregularities observed in the surface potential isotherms. The PM-IRRAS spectra displayed changes in the peaks assigned to the alkyl chains of DPPC upon insertion of ibuprofen, which indicates that the drug can be inserted into the hydrophobic regions of the membranes.

[1] J. Gravier, Chemistry and Physics of Lipids, 158, (2009)102