Interfacial study of a bile salt onto surfactant-covered oil-water interfaces

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Bile salts (BS) are important agents in lipid digestion and adsorption. In this process, high amounts of BS micelles are involved and could induce depletion flocculation by non-adsorbed micelles that are excluded from the interstitial space, as shown in a previous study [1]. In addition, adsorption of BS onto lipid droplet surfaces allowed us to explain the higher stability of oil-in-water (O/W) emulsions as well as the more negative electrophoretic mobility at low bile salt concentrations, as compared with emulsions in the absence of BS [1]. Furthermore, the effect of emulsifier type - poloxamer Pluronic F68 (non-ionic) and phospholipids Epikuron 145V (anionic) - was also observed. The aim of our study is to probe the effect of these surfactants on the interfacial behaviour of a bile salt (sodium taurodeoxycholate, NaTDC) in order to further relate to the physicochemical properties observed in O/W emulsions stabilized by the same systems in the presence of this BS [1]. This is done by means of a pendant drop film balance equipped with a subphase exchange technique [2], which allows penetration studies. This is done by adding the bile salt directly into the subphase once the surfactant has been previously adsorbed onto the oil-water interface. We monitor the evolution of the interface by measuring the interfacial tension and the dilatational rheology. Then, we compare with the interfacial tension data of individual systems onto clean interface, to which a thermodynamic model was applied. The interfacial tension study showed that Pluronic adsorbed layer was more resistant to bile salt adsorption than Epikuron interfacial layer. This correlates with results of depletion flocculation of O/W emulsions induced by BS micelles: Pluronic provided higher stability than Epikuron. We have shown that interfacial techniques provides a better understanding of BS at oil-water interfaces, as this is one of the main challenges in order to clarify the mechanisms involved in lipid digestion and adsorption.
