Lysine based surfactants: relationship between chemical structure and adsorption/aggregation properties

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The economic importance of cationic surfactants was realized early in 1935, when their bacteriostatic properties were discovered, leading to many commercial products as sanitizing and antiseptic agents, germicides, fungicides, and as components in pharmaceutical and cosmetic formulations. In these latter applications adverse effects may occur causing eye and skin irritation. Therefore it is paramount to develop new surfactants with low toxicity profiles. During the last 20 years, our group has been developing new biocompatible surfactants derived from amino acids. Among them, Lysine derivative surfactants constitute a novel class that can be regarded as an alternative to conventional cationic surfactants. This work reports on the relationship between the structure and adsorption/aggregation properties of ten Lysine-based surfactants including surfactants with one single chain and gemini surfactants (see figure 1).

The critical micellar concentration was determined using conductivity and ionic activity (Cl⁻ and H⁺). The cmc for single chain surfactants are of the same order of magnitude than commercial cationic surfactants. Concerning gemini surfactants, cmc are one order of magnitude smaller than those of single chain surfactants. The adsorption behavior at the air/water interface was studied with a Langmuir balance. The spread monolayer behavior for lysine based surfactants and their mixtures with dipalmitoyl phosphatidyl choline will be reported.

Figure 1. Chemical structure of Lysine-based surfactants.