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Evaluation of the micellization of the biosurfactant sodium taurocholate using fluorescence measurements

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Sodium taurocholate is a salt secreted by bile and present in gastrointestinal fluids. This amphiphilic molecule has a hydrophilic part made up of hydroxyl groups and a sulfonate group, and a non-polar part made up of methyl groups. Its ability to form micelles, once the critical micelle concentration is reached, gives it very interesting physicochemical characteristics at a biological level. The micelles make it possible to house substances that have low solubility in aqueous media, such as most of the drugs in common use and administered orally. The incorporation into the structure improves the solubilization of bioactive substances in gastrointestinal fluids, and hence favor their absorption and transport to the site/s of action.

In the present work, in order to understand the micellization process of sodium taurocholate at 25ºC in three different media, the range of concentrations in which the micellization process takes place has been evaluated, and an average value has been established as the associated critical micellar concentration. Although there are different analytical techniques to evaluate this process, molecular fluorescence has been selected due to its sensitivity and availability. Typically, a fluorophore is selected and the fluorescence change thereof is measured in the absence and presence of micelles. Here, two fluorescent markers have been used with comparative purposes: propranolol, tetracaine. Furthermore, since taurocholate itself is fluorescent, its use as an autolabel has been considered. For data processing, two different methods have been used. In the first, the cmc corresponds to the sodium taurocholate concentration value where a change in slope is observed (this is, the interface between the pre-micellar and the post-micellar zones). In the second, the Boltzman equation is adjusted to the experimental data to obtain both, the cmc and the range of micellization.

The cmc value for sodium taurocholate is 10 mM in water. When pH and ion strength are moved to more biorelevant conditions (maleic buffer at pH 6.5 and I~120 mM that mimics an intestinal fluid in the fasted state, and maleic buffer at pH 5.8 and I~260 mM that mimics an intestinal fluid in the fed state) the micellization is favoured and the cmc value diminishes to 7 mM. No significant differences have been detected between the results obtained in the absence and the presence of the two markers. In addition, the values are similar to those reported in the literature for water medium [1].

[1] S. M. Meyerhoffer, L. B. McGown, Critical micelle concentration behavior of sodium taurocholate in water, *Langmuir* **6(1)** (1990) 187-191. https://doi.org/10.1021/la00091a030