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On the reproducibility problems of surface pressure – area isotherms of bovine β-casein layers at the air/water interface

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β-casein is one of the constituents of the casein micelle found in milk and dairy products. It is composed of 209 amino acids without a pronounced secondary structure, has a molecular mass of 24 kDa, and contains both hydrophilic and hydrophobic segments; hence, it is surface active (CMC ≈ 0.5 mg/mL). The enzymatic degradation of β-casein is an important process in cheese making, and also contributes to the deterioration of milk. Our primary goal was to study the enzymatic degradation of β-casein in monolayers, spread at the air/water interface. When searching the literature for reference surface pressure – area isotherms, we soon found out that a number of very different isotherms have been reported, apparently recorded within very similar conditions. This gave the motivation of this work, to systematically review the most important parameters, such as spread concentration, spread volume, waiting time and compression rate, that determine the repeatability of the isotherms. A statistical treatment of the results is presented in this multidimensional parameter space. The main conclusion of the work is that the reproducibility problems arise from the fact that β-casein layers at the air/water interface can be regarded as a mixture of Langmuir and Gibbs types of layers.

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