Thermodynamic and Structural Changes Associated to the Interaction of a Dirhamnolipid Biosurfactant with Bovine Serum Albumin

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The interaction of a dirhamnolipid biosurfactant secreted by *Pseudomonas aeruginosa* with bovine serum albumin was studied by means of various physical techniques. The binding of the biosurfactant to bovine serum albumin was first characterized by isothermal titration calorimetry, showing that two molecules of dirhamnolipid, in the monomer state, bound to one molecule of the protein with high affinity (binding constant, \( K = 2 \times 10^5 \text{ M}^{-1} \)). These results were confirmed by surface tension measurements, in the absence and presence of bovine serum albumin. Fitting of the surface tension data to the Langmuir-Szyszkowski equation yielded an affinity constant in very good agreement with the previous one. As seen by differential scanning calorimetry dirhamnolipid shifted the temperature of the thermal unfolding of bovine serum albumin toward higher values, thus increasing the stability of the protein on heating. The impact of dirhamnolipid on the structure of the native protein was low, since most of the secondary structure remained unaffected upon interaction with the biosurfactant, as shown by the study of the amide I’ band by means of FTIR spectroscopy. Interestingly, 2D correlation infrared spectroscopy indicated that the sequence of temperature-induced changes in native bovine serum albumin changed in the presence of the biosurfactant. Summarizing, our data show low binding ratios of dirhamnolipid to BSA, the absence of denaturation effect and, on the contrary, stabilization against the thermal denaturation of the protein. This suggests that dirhamnolipid could be an interesting tool for protein studies and membrane protein purification procedures.