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Effect of ultrasound on the chemical and thermal stability of alpha-lactalbumin

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Abstract

Ultrasound is sound whose frequency is too high for humans to hear which is in the frequency range of 20 Hz–20 kHz, and the frequency of ultrasound waves is above 20 kHz. The aim of this study was to observe the effect of ultrasound and sonication (20 kHz prob) on heat and chemical stability of α-lactalbumin. The interaction of anionic surfactant, SDS, and cationic surfactant, DTAB, with α-lactalbumin in the absence and presence of ultrasound has been investigated using UV and fluorescence spectroscopy. α-lactalbumin was denatured in a 2-state process. Using UV spectroscopy, the stability of α- lactalbumin ($\Delta G^0_{H_2O}$) was the least upon treatment with SDS in the absence of ultrasound (7.483 kJ.mol^{-1}) and this amount increases after 20 minutes of sonication time (8.691 kJ.mol^{-1}). Also, the stability of α- lactalbumin ($\Delta G^0_{H_2O}$) was the least upon treatment with DTAB in the absence of ultrasound (8.817 kJ.mol^{-1}) and this amount increases after 20 minutes of sonication time (11.210 kJ.mol^{-1}). Thermodynamic parameters (ΔH_m, ΔC_p, T_m and $\Delta G^0(H_20)$) were determined for the thermal denaturation of bovine α-lactalbumin in the absence and presence of ultrasound using UV spectroscopy. Results shows that ultrasound increases the heat stability and T_m of α-lactalbumin and decreases the ΔH_m and $\Delta C_{p,m}$.

Keywords: α-lactalbumin, Ultrasound waves, Surfactant, Fluorescence, Thermal stability.

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