

Thermodynamic analysis of biomolecular interactions by using isothermal titration calorimetry (ITC)

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Usual function of α -lactalbumin (α -LA) is synthesizing lactose as a coenzyme, however, it can gain an unusual function of inducing apoptosis selectively for cancer cells. For that the α -LA is required to form a complex with oleic acid. There are extensive researches on the structural properties of this complex, but its thermodynamic mechanism is still unclear. In this work, we apply ITC analysis mainly to elucidate both the thermodynamic mechanism and the reaction stoichiometry underlying the complexation between sodium oleate (SO) and apo bovine α -LA (apo BLA). The SO-apo BLA complexation was governed by hydrophobic interaction meaning that it was driven by entropy change (ΔS). Also its stoichiometry was determined as ~ 12.0 . In addition Ca^{2+} and ANS (8-anilino-1-naphthalene sulfonic acid) binding phenomena were analyzed by ITC. In contrast, the Ca^{2+} binding was driven by enthalpy change (ΔH) indicating an electrostatic interaction. Eventually this work will provide insight on how ITC analysis can contribute to understanding the thermodynamic mechanism and thus developing a thermodynamic criterion to set up the optimum process for universal anti-cancer agent.