OC08 - 25011 - EFFECTS OF MODERATE ELECTRIC FIELDS IN BETA-LACTOGLOBULIN THERMAL DENATURATION – STRUCTURAL CHANGES AND BINDING PROPERTIES

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Abstract

Innovative and emerging technologies involving the direct application of external electric fields are attracting the attention of research and the industry due their unique processing advantages. The particular case of ohmic heating and its associated moderate electric fields (MEF) have demonstrated potential to control protein functionality. However, the putative effects of MEF on biomaterials have raised questions about their specific interaction pathways, while few answers have been provided. In this study, we aimed at evaluating the effects of MEF presence in beta-lactoglobulin (β-lg) structure and interactions upon thermal denaturation. Simultaneously to the MEF treatments, control experiments (without the presence of electric field) were performed to stablish a background for the thermal related effects. Secondary structure analysis based on the far-UV-CD spectra confirmed that the application of MEF resulted in different structural features of the protein, consistent with the loss of α-helix and β-strand and increase of random coil fractions. The assessment of the endogenous tryptophan fluorescence confirmed different local conformations resultant form the MEF exposure. The use of ANS - as fluorescent hydrophobic probe - also shown that MEF was able to increase accessibility to β-lg hydrophobic sites. The impact of the observed structural changes were evaluated on the formation of β-lg – retinol nano-complex, where a higher binding constant was observed for the MEF exposed samples. These results provide evidences for the MEF action during the unfolding of β-lg, which in turn results in important modifications at structural and functional level. Application of MEF open new perspectives for the application of processing strategies aiming to control protein functionality and develop novel protein-based delivery systems.

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