ECB 2021

sciforum

Abstract

Structural Analyses of Metallodrug/β-lactoglobulin Adducts for Rational Design of New Biomaterials †

Domenico Loreto [1], Antonello Merlino [1] and Giarita Ferraro [2]

[1] Department of Chemical Sciences, University of Naples Federico II, Naples, Italy
[2] Department of Chemistry "Ugo Schiff", University of Florence, FI, Italy
† Presented at the 1st International Electronic Conference on Biomedicine, 1–26 June 2021; Available online: https://ecb2021.sciforum.net/.

Published: 31 May 2021

β-lactoglobulin (BLG) is a whey carrier protein of 18.4 kDa. This protein is a good system for the preparation of micro- or nanoparticles for pharmaceutical industry because of high solubility, safe status, biodegradable nature, gel forming ability, abundance, stability at acidic pH and stability against gastric pepsin. In fact, it has been demonstrated that β-lactoglobulin–pectin nanoparticles are able to transfer cytotoxic Pt compounds to cancer cells. With the aim to unveil the molecular basis of the metallodrug recognition by BLG, we are analyzing the interactions between this protein and a number of metallodrugs. The interaction between cisplatin, the most used Pt-based anticancer agent, and BLG has been investigated both in solution and at solid state. The results reveal that cisplatin interacts with the protein coordinating Met7, His146 and Lys8 side chains, without affecting the overall protein 3D structure. Oxaliplatin is preferred to cisplatin because of a lower toxicity and an increased reactivity against cisplatin resistant tumors. The interaction between oxaliplatin and BLG has been explored in solution by spectroscopic and theoretical techniques. Fluorescence, Resonance Energy Transfer, and molecular docking have shown that BLG interacts with oxaliplatin through hydrophobic interactions and suggest the existence of a single binding site. Circular Dichroism analyses reveal that the overall structure of the protein is not altered upon interaction with the metal complex. Structural analysis at solid state is ongoing for providing further insight about the interactions between the protein and oxaliplatin at the binding site. These results suggest that BLG could act as a carrier for anticancer metallodrugs and open the way for a rational design of new biomaterials based on metallodrug/β-lactoglobulin adduct nanoparticles.