MS03-P05

Effect of pressure on the crystal structure and adsorption of β-lactoglobulin

Katarzyna Kurpiewska[1], Artur Biela[2], Joanna I. Loch [1], Sylwia Świątek[3], Barbara Jachimska[3], Krzysztof Lewiński[1]

1. Jagiellonian University, Department of Crystal Chemistry and Crystal Physics, Faculty of Chemistry, Kraków, Poland
2. Jagiellonian University, Bionanoscience and Biochemistry Laboratory, Małopolska Centre of Biotechnology, Kraków, Poland
3. Jerzy Haber Institute of Catalysis and Surface Chemistry, Polish Academy of Sciences, Kraków, Poland

email: kurpiews@chemia.uj.edu.pl

β-Lactoglobulin (LGB) is of a huge importance to the food industry mostly because it is a principal whey protein [1]. Since pressurization is gaining a particular interest as an alternative procedure for milk products processing the pressure effects on this small protein has been extensively studied by the food community [2]. Wide range of methods was used to characterize biochemical properties of β-lactoglobulin after or during pressurization [3].

Presented studies concern the analysis of the β-lactoglobulin conformation observed in the crystal state determined at pressure 430 MPa. Structural changes in high pressure LGB structure revealed by X-ray diffraction were correlated with the physicochemical properties of pressure-treated β-lactoglobulin examined by dynamic light scattering, electrophoretic mobility and quartz crystal microbalance with dissipation monitoring measurements.

Examination of pressure effects on the conformation of LGB has shown that it is possible to observe starting stages of dimer dissociation under pressure of 430 MPa in the crystal state. Additionally, a number of local and global changes within a protein molecule has been identified as a result of pressure perturbation. Comparison of ambient and high pressure β-lactoglobulin zeta potential values and effectiveness of their adsorption onto gold surface allowed to propose and justify different scenarios of LGB adsorption (Fig 1.). Our results imply that modification of milk proteins for desirable functional properties requires careful selection of pressure-treatment conditions.

Acknowledgements: The research was carried out with the equipment purchased thanks to the financial support of the European Regional Development Fund in the framework of the POIG Program (contract no. POIG.02.01.00-12-023/08) and grant NCN OPUS 2012/07/B/ST5/00767

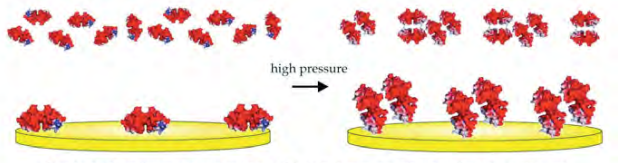

Fig.1 Model of a different pathway involved in LGB adsorption on the gold surface for native protein and for protein pressurized up to 430 MPa (after decompression).

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Keywords: high pressure protein crystallography, adsorption, β-lactoglobulin