SMALL-ANGLE SCATTERING STRUCTURAL STUDY OF pH-EFFECT IN BETA-LACTOGLOBULIN – ALGINATES COMPLEXES

L. Anghel[1], A.I. Kuklin[2], O. Ivankov[2], V.I. Bodnarchuk[2], and R.V. Erhan[2,3]

[1]*Institute of Chemistry, Chisinau, Republic of Moldova*
[2]*Frank Laboratory of Neutron Physics, Joint Institute for Nuclear Research, Dubna, Russia*
[3]*Horia Hulubei National Institute for R&D in Physics and Nuclear Engineering, Bucharest - Magurele, Romania*

E-mail: anghel.lilia@gmail.com

β-Lactoglobulin is the major whey protein abundant in cow's milk. β-Lactoglobulin is a lipocalin whose structure contains β-barrel with eight antiparallel β-strands and one major α-helix at the end of the molecule. This protein has been widely used in the food and pharmaceutical industries due to its rheological and structural characteristics (e.g. unfolding, aggregation and gelation properties) [1].
β-Lactoglobulin is capable of binding various hydrophobic ligands, such as fatty acids and vitamins, carbohydrates, proteins and even inorganic elements [2]. At the present there is a gap with regard to the knowledge of β-lactoglobulin and polysaccharides interactions.
Our previous results from SANS data reduction and ab initio modeling for the systems containing only β-lactoglobulin showed that at pH 5.8 this protein possibly undergoes two processes: (I) the N-to-Q transition, i.e. the transition from the more compact conformation of the native form (N), Rg=19.43 Å, to the acidic form (Q), Rg=25.59 Å, and (II) aggregation or chain-like homo-multimeric protein complexes [3]. SANS data reduction and ab initio modeling of systems containing β-lactoglobulin and sodium alginate show that at pH 5.8 in the presence of sodium alginate, β-lactoglobulin predominates in a compact chain–like arrangement of corresponding to the size of the β-lactoglobulin homo-dimer.
We found that at pH 5.8, β-lactoglobulin undergoes homo-oligomerization –concentration dependent process, whilst the presence of sodium alginate in the system stabilizes β-lactoglobulin homo-dimeric forms.
Thus, a complex SANS study was carried out at the YuMO small-angle neutron spectrometer, IBR-2 pulsed reactor within 0.01 Å ≤ q ≤ 0.30 Å q-range for the β-lactoglobulin / sodium alginate system. The general goal of this study is to examine the influence of pH on the *β*-lactoglobulin alginate interactions and formation of the complexes.

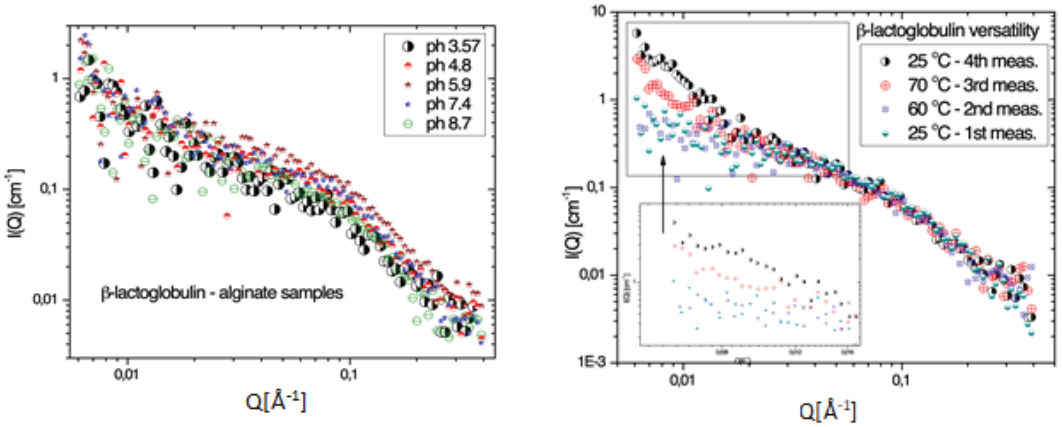

Figure 1. pH and temperature influence studied by small angle neutron scattering (preliminary data).

[1] C. Schmitt, S.L. Turgeon (2011), Advances in Colloid and Interface Science. 167, 1–2 pp. 63-70.
[2] S. Le Maux, et al. (2014), Dairy Science & Technology. 94, 5 pp 409-426.
[3] L.Anghel, A.Rogachev, A.Kuklin, R.V.Erhan (2019). β-Lactoglobulin associative interactions: a small-angle scattering study. European Biophysics Journal. 48, 285-295.