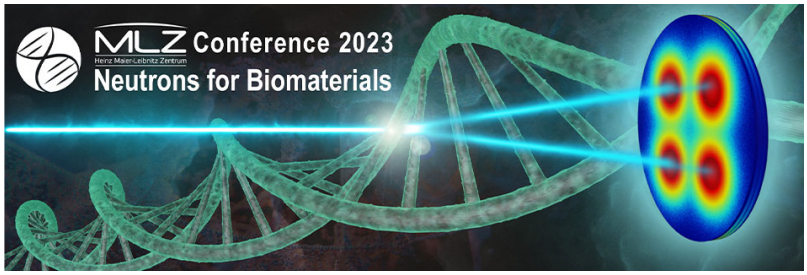

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Mucin –a colloidal sol: insights from scattering studies

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Mucins are an important group of biomacromolecules that function as soft wet barriers to chemical transport and shear stress in the physiological milieu [1]. They are characterized by a charged and highly glycosylated linked peptide backbone and a propensity to form cross-links by a range of mechanisms. The fundamental structural unit is a bottle-brush-like morphology organized into higher level aggregates, or networks forming a gel which is resistant to flow. By virtue of domains involving hydrophilic/hydrophobic, hydrogen bonds and electrostatic interactions, mucins have a complex hierarchical structure [2]. Small angle scattering, its ability to probe the hierarchy of structure over length-scales many orders in magnitude, and its ability to characterize structure during a perturbation (e.g. shear), is an ideal method of investigation.

In this work, we study the dilute dispersions of a commercial pig gastric mucin (PGM). Bulk rheology of the aqueous dispersions exhibits a transition from Newtonian to shear thinning response with increase in mucin concentration, indicating the existence of a colloidal sol behavior. Hence, a single mucin particle comprises of an internal network of bottle-brushes, which further aggregates into globular blobs at higher concentrations. Comprehending the corresponding interactions, and possible effect of varied salt/pH conditions is of interest to biological applications. Therefore, extended small angle neutron scattering (USANS, SANS [3-5]) studies were performed in a deuterated solvent, at different mucin concentrations and increasing ionic strength. These measurements were sensitive to the radius of gyration of mucin particles, the electrostatic interactions between particles, and more importantly the electrostatically mediated intra-particle mucin chain correlations that dictate the degree of compaction within the particle.

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Primary authors: Dr KODUVAYUR ANANTHANARAYANAN, Ramya (Post doctoral fellow, TUM Garching); GARVEY, Christopher (MLZ)

Co-author: Dr DE CAMPO, Liliana (Instrument Scientist)

Presenter: Dr KODUVAYUR ANANTHANARAYANAN, Ramya (Post doctoral fellow, TUM Garching)

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