Spectroscopic studies of the interactions between β-lactoglobulin and bovine submaxillary mucin - DTU Orbit (06/12/2018)

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The structural changes occurring during the interaction between β-lactoglobulin (BLG), the major whey protein, and bovine submaxillary mucin (BSM), a major salivary protein, were studied using high and low field Nuclear Magnetic Resonance (NMR), Dynamic Light Scattering (DLS), and Circular Dichroism (CD) spectroscopy. The zeta potentials of the proteins were also measured to provide information on the role of electrostatic forces in the interaction. The ratio between BLG and BSM was 1:1, and pH was adjusted to 3.0, 5.0 and 7.4 at room temperature. These spectroscopic results suggested that the interaction between BSM and BLG led to a compact aggregation. DLS results of the mixture showed a size distribution which is intermediate between that of BLG (215 nm) and BSM (200 nm). While no particular changes in the secondary structure were observed in either BSM or BLG, a weak tertiary structure, observed in BLG only, was further weakened upon interaction with BSM. High field NMR results for the BSM-BLG mixture indicated that spectral differences were mostly observed for solvent exposed groups, especially the mucin glycan chains, while hydrophobic core residues were less affected. The interaction between the two proteins can thus be concluded to be mostly of hydrophilic origin. Moreover, low field NMR measurements showed a decrease in transverse relaxation times in the mixture compared to the pure BLG and buffer solutions. This is possibly connected to fewer hydrophilic binding sites available in the BLG–BSM mixtures for water–protein interaction after aggregation of the two proteins.

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