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Probing Protein Conformations at the Oil-water Interface Using Single-Molecule Force Spectroscopy AHMED TOUHAMI, MARCELA ALEXANDER, MILENA CORREDIG , JOHN DUTCHER , University of Guelph
— The present work aims at a deeper understanding of the conformational changes in Beta-lactoglobulin (BLG) protein adsorbed onto the oil-in-water emulsion interfaces due to variations in pH. Mechanical unfolding of BLG using AFM-single-molecule force spectroscopy (AFM-SMFS) was performed on single oil droplets that were mechanically trapped in a polycarbonate filter. The changes in the contour length upon each unfolding event were determined by fitting the WLC model of polymer elasticity to each of the BLG peaks. Our results show clearly that at pH 2.5 BLG exists as a dimer in which each monomer is similar to two Immunoglobulin domains. At pH 6.8 BLG on the oil droplets adopts a conformation consisting of domains with a contour length of 11 nm. Furthermore, at pH 9 the interactions between the AFM tip and the BLG layer on the oil droplet surface are dominated by a huge repulsion due to the highly negatively charged BLG layer. This study demonstrates a novel application of AFM-SMFS to investigate the underlying mechanisms by which proteins can be used to stabilize food products.

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