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Probing Protein Conformation Changes in Food Nanostructure
AHMED TOUHAMI, University of Texas at Brownsville, MARCELA ALEXANDER , University of Guelph, Guelph, Ontario, Canada, MILENA CORREDIG , Uinversity of Guelph, Guelph, Ontario, Canada — Here we use AFM-single molecule force spectroscopy to probe the conformational changes in Beta-lactoglobulin (BLG) protein adsorbed onto the oil-in-water interface due to variations in pH. Single oil droplets are mechanically trapped and the AFM tip is used to grape and unfolds BLG molecules. 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 of the force-extension profiles. Our results show clearly that BLG on the same oil droplet adopts different conformations at different pH regions. While at pH 2.5, the unfolded BLG has a contour length similar to the total length of single monomer with two large unfolding barriers, the protein exists mainly as a dimer formed of several smaller domains at pH 6.8. Furthermore, at pH 9 the interactions between the AFM tip and the BLG layer on the oil droplet are dominated by an important repulsion due to the highly negatively charged BLG layer. This study demonstrates a novel application of single molecule force spectroscopy to investigate the underlying mechanisms by which proteins can be used to stabilize food products.

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