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Probing protein conformations at the oil droplet–water interface using single-molecule force spectroscopy AHMED TOUHAMI, University of Texas at Brownsville, MARCELA ALEXANDER, MILENA CORREDIG, JOHN DUTCHER, University of Guelph, Guelph Canada — We have used atomic force microscopy (AFM) imaging and single molecule force spectroscopy (SMFS) to study β-lactoglobulin (β-LG) molecules localized at the interface between oil droplets and water. To immobilize the oil droplets, we have mechanically trapped them in the pores of a filtration membrane. For this sample geometry, we have used SMFS to pull on the β-LG molecules, revealing changes in their conformation and oligomerization in response to in situ changes in pH. We have compared the present results with those obtained previously for SMFS measurements of b-LG molecules adsorbed onto mica surfaces. At neutral pH, we observe large differences between the results obtained for the two surfaces in the pulling force required to fully extend the molecules, the spacing between sawtooth peaks in the force–distance curves, and the oligomerization of the molecules. The mechanical unfolding of the adsorbed β-LG molecules at pH 2.5 was very similar for the two surfaces. For pH 9.0, we find that, for both surfaces, there is an irreversible change in the conformation of the β-LG molecules with a strong repulsion measured between the AFM tip and the β-LG molecules. This study provides insight into structural changes of this protein when adsorbed onto an oil–water interface, and demonstrates the potential of SMFS as a tool to study the structure of proteins that are important in complex matrices such as food emulsions.

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