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Local viscoelasticity of the surfaces of individual Gram-negative bacterial cells measured using atomic force microscopy VIRGINIA VADILLO-RODRIGUEZ, TERRY BEVERIDGE, JOHN DUTCHER, University of Guelph — The cell wall of Gram-negative bacteria performs many important biological functions: it plays a structural role, it allows the selective movement of molecules across itself, and it allows for growth and division. These functions not only suggest that the cell wall is dynamic, but that its mechanical properties are very important. We have used a novel, AFM-based approach to probe the mechanical properties of single bacterial cells by applying a constant compressive force to the cell under physiological conditions while measuring the time-dependent displacement (creep) of the AFM tip due to the viscoelastic properties of the cell. For these experiments, we chose a representative Gram-negative bacterium, *P. aeruginosa* PAO1, and we used AFM tips of different size and geometry. We find that the cell response is well described by a three element mechanical model with an effective cell spring constant k and an effective time constant τ for the creep motion. Adding glutaraldehyde, which increases the covalent bonding of the cell surface, produced a significant increase in k and a significant decrease in τ.

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