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EPS forces in Bacillus subtilis biofilms WENBO ZHANG, THOMAS ANGELINI, SHIH-MING TSAI, RYAN NIXON, University of Florida — Bacteria have evolved to congregate in complex communities known as biofilms. The structure that holds a biofilm together is a matrix called extracellular polymeric substance (EPS). It has been observed in previous studies that EPS up-regulation occurs when the nutrient levels fall below a threshold concentration; this increase in EPS concentration produces an osmotic pressure that forces the colony to spread outward. This osmotic pressure may drive nutrient uptake, but the stresses generated by the EPS matrix has never been measured. Here we present measurements of the forces exerted by a biofilm on its supporting substrate and on its fluid nutrients. In our experiments, we use a technique analogous to traction force microscopy to measure strain in agar nutrient substrates imposed by Bacillus subtilis biofilms. By running additional test to measure the permeability and elastic modulus of the agar, we can estimate the pressure generated by the biofilm.

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