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Characterization of MreB polymers in E. coli and their correlations to cell shape JEFFREY NGUYEN, Princeton University, Dept. of Physics, NIKOLAY OUZONOV, ZEMER GITAI, Princeton University, Dept. of Molecular Biology, JOSHUA SHAEVITZ, Princeton University, Dept. of Physics — Shape influences all facets of how bacteria interact with their environment. The size of E. coli is determined by the peptidoglycan cell wall and internal turgor pressure. The cell wall is patterned by MreB, an actin homolog that forms short polymers on the cytoplasmic membrane. MreB coordinates the breaking of old material and the insertion of new material for growth, but it is currently unknown what mechanism sets the absolute diameter of the cell. Using new techniques in fluorescence microscopy and image processing, we are able to quantify cell shape in 3- dimensions and access previously unattainable data on the conformation of MreB polymers. To study how MreB affects the diameter of bacteria, we analyzed the shapes and polymers of cells that have had MreB perturbed by one of two methods. We first treated cells with the MreB polymerization-inhibiting drug A22. Secondly, we created point mutants in MreB that change MreB polymer conformation and the cell shape. By analyzing the correlations between different shape and polymer metrics, we find that under both treatments, the average helical pitch angle of the polymers correlates strongly with the cell diameter. This observation links the micron scale shape of the cell to the nanometer scale MreB cytoskeleton.

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