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Cell shape acquisition and maintenance in rodlike bacteria SVEN VAN TEEFFELEN, NED WINGREEN, ZEMER GITAI, Department of Molecular Biology, Princeton University, Princeton, NJ 08544 — The shape of rodlike bacteria such as *Escherichia coli* is mainly governed by the expansion and reorganization of the peptidoglycan cell wall. The cell wall is a huge, mostly single-layered molecule of stiff glycan strands that typically run perpendicular to the long axis and are crosslinked by short peptides. The wall resists the excess pressure from inside the cell. Although much is known about the enzymes that synthesize the wall, the mechanisms by which the cell maintains a constant rod diameter and uniform glycan strand orientation during growth remain unknown. Here we present quantitative results on the structure and dynamics of two essential proteins, which are believed to play an important role in cell wall synthesis. In particular, we have focused on the filament-forming protein MreB, an actin homolog that forms a long helical bundle along the inner membrane of the cell, and penicillin-binding protein 2, an essential protein for peptide bond formation in the periplasm. Based on their interplay we discuss the possibility of MreB serving as a guide and ruler for cell wall synthesis.

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