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Mechanism for longitudinal growth of rod-shaped bacteria SWADHIN TANEJA, BEN LEVITAN, ANDREW RUTENBERG, Dalhousie University, NS, Canada — The peptidoglycan (PG) cell wall along with MreB proteins are major determinants of shape in rod-shaped bacteria. However the mechanism guiding the growth of this elastic network of cross-linked PG (sacculus) that maintains the integrity and shape of the rod-shaped cell remains elusive. We propose that the known anisotropic elasticity and anisotropic loading, due to the shape and turgor pressure, of the sacculus is sufficient to direct small gaps in the sacculus to elongate around the cell, and that subsequent repair leads to longitudinal growth without radial growth. We computationally show in our anisotropically stressed anisotropic elasticity model small gaps can extend stably in the circumferential direction for the known elasticity of the sacculus. We suggest that MreB patches that normally propagate circumferentially [1], are associated with these gaps and are steered with this common mechanism. This basic picture is unchanged in Gram positive and Gram negative bacteria. We also show that small changes of elastic properties can in fact lead to bi-stable propagation of gaps, both longitudinal and circumferential, that can explain the bi-stability in patch movement observed in $\Delta mbl\Delta mreb$ mutants.

[1] J. Domínguez-Escobar *et al.*, Science

Swadhin Taneja
Dalhousie University, NS, Canada

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