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Processive motions of MreB micro-filaments coordinate cell wall growth[1]

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Rod-shaped bacteria elongate by the action of cell-wall synthesis complexes linked to underlying dynamic MreB filaments, but how these proteins function to allow continued elongation as a rod remains unknown. To understand how the movement of these filaments relates to cell wall synthesis, we characterized the dynamics of MreB and the cell wall elongation machinery using high-resolution particle tracking in *Bacillus subtilis*. We found that both MreB and the elongation machinery move in linear paths across the cell, moving at similar rates (∼20nm / second) and angles to the cell body, suggesting they function as single complexes. These proteins move circumferentially around the cell, principally perpendicular to its length. We find that the motions of these complexes are independent, as they can pause and reverse,and also as nearby complexes move independently in both directions across one surface of the cell. Inhibition of cell wall synthesis with antibiotics or depletions in the cell wall synthesis machinery blocked MreB movement, suggesting that the cell wall synthetic machinery is the motor in this system. We propose that bacteria elongate by the uncoordinated, circumferential movements of synthetic complexes that span the plasma membrane and insert radial hoops of new peptidoglycan during their transit.

[1]Watching the motions of the cell wall synthesis machinery and underlying cytoskeleton in B. subtilis with high precision particle tracking.