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**The bacterial gliding machinery**

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Cells of Flavobacterium johnsoniae, a rod-shaped bacterium, glide over surfaces with speeds reaching up to 2 micrometer's. Gliding is powered by a protonmotive force. The adhesin SprB forms filaments about 160 nm long that move on the cell-surface along a looped track. Interaction of SprB filaments with a surface produces gliding. We tethered F. johnsoniae cells to glass by adding anti-SprB antibody. Tethered cells spun about fixed points, rotating at speeds of about 1 Hz. The torques required to sustain such speeds were large, comparable to those generated by the flagellar rotary motor. Using a flow cell apparatus, we changed load on the gliding motor by adding the viscous agent Ficoll to tethered cells. We found that a gliding motor runs at constant speed rather than constant torque. We attached gold nanoparticles to the SprB filament and tracked its motion. We fluorescently tagged a bacterial Type IX secretion system (T9SS) protein and imaged its dynamics. Fluorescently tagged T9SS protein localized near the point of tether, indicating that T9SS localizes with the gliding motor. Based on our results, we propose a model to explain bacterial gliding.