The mechanism of force transmission at bacterial focal adhesion complexes

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Various rod-shaped bacteria mysteriously glide on surfaces in the absence of appendages such as flagella or pili. In the deltaproteobacterium *Myxococcus xanthus*, a putative gliding motility machinery (Agl–Glt) localizes to so-called Focal Adhesion sites (FA) that form stationary contact points with the underlying surface. In this work, we observed by 3D fluorescence microscopy and TIRF that the Agl–Glt machinery contains an inner-membrane motor complex that moves intracellularly along a right-handed helical path, and when it becomes stationary at FA sites, it powers a left-handed rotation of the cell around its long axis. At FA sites, force transmission requires cyclic interactions between the molecular motor and adhesion proteins of the outer membrane via a periplasmic interaction platform, which presumably involves a contractile activity of motor components and possible interactions with the peptidoglycan.