BACTERIAL PHYSIOLOGY

RodZ helps *E. coli* stay in shape

Bacteria work hard to maintain their shape, but even though several proteins that play a part in the maintenance of cell shape have been identified in rod-shaped bacteria, the mechanism of cell-shape determination is not well understood. Now, writing in *The EMBO Journal*, Shiomi, Sakai and Niki describe a protein that regulates the length of the cell, but not the width.

By microscopic observation of individual mutated *Escherichia coli* strains, Shiomi and colleagues identified round or oval cells that were mutated in a gene they renamed *rodZ*. *rodZ* mutants were viable, but grew slowly, and careful quantitation revealed that although *rodZ* cells are shorter than wild-type bacteria, they are only slightly wider. By contrast, when *MreB* or *Pbp2* (penicillin-binding protein 2), two previously characterized cell-shape proteins, were inhibited, cells became wider but maintained their length.

RodZ was shown to be an integral inner-membrane protein

that formed spirals around the cells and colocalized with *MreB*. However, *MreB* and RodZ did not require each other for correct localization. A helix–turn–helix domain in the cytoplasmic part of the protein was required for the formation of spirals by RodZ, whereas the transmembrane domain and a periplasmic domain were required for the maintenance of cell shape. Interestingly, truncated forms of RodZ that were uniformly dispersed throughout the plasma membrane could partially complement a *rodZ* deletion, indicating that localization of this protein is not required to maintain its function. Homologues of RodZ are widespread among rod-shaped gammaproteobacteria.

The authors proposed a model for cell-shape maintenance in which cell length and width are independently regulated: *MreB* and *Pbp2* maintain the width of the cell, whereas RodZ regulates the length. Further evidence for this model came from over-expression of *rodZ*, which led to a small increase in cell length. The next step will be to identify how RodZ functions to maintain cell shape.

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ORIGINAL RESEARCH PAPER Shiomi, D., Sakai, M. & Niki, H. Determination of rod shape by a novel cytoskeleton membrane protein. *EMBO J.* 13 Nov 2008 (doi:10.1038/emboj.2008.234)

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