

A Polar Decision Maker in *Shewanella*

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In many bacteria, the decision between the planktonic and sessile life style is regulated by the secondary messenger molecule c-di-GMP. The cells often harbor a number of proteins that exhibit diguanylate cyclase (DGC) and/or phosphodiesterase (PDE) activity and may, therefore, be involved in contributing to the level of cellular c-di-GMP.

The gammaproteobacteria of the genus *Shewanella* are quite enriched in proteins with putative DGC/PDE activity. However, in *S. putrefaciens* (and *S. oneidensis*) it is just a single one out of 51 putative DGCs/PDEs that, under most conditions, mainly determines the cellular decision whether to stay or to run. This protein, PdeB, is a multidomain hybrid DGC/PDE, which acts as a PDE upon perceiving its triggering signal. PdeB regulates the activity of both polar and secondary flagellar systems, chemotaxis and twitching motility versus attachment factors such as MSHA type IV pili and surface adhesion proteins upon differences in media conditions. We determined the mechanism underlying the spatiotemporal control of PdeB activity, which mediates pronounced heterogeneity in a *Shewanella* population and optimizes spreading of the cells in dependence of the environmental conditions.