IN BRIEF

APPLIED MICROBIOLOGY

Shining a light on biofuels

Microorganisms that can reduce CO_2 to acetate can be used to generate biofuels. However, CO_2 reduction requires an electron source, usually in the form of H_2, which is costly to produce and difficult to handle. Now, Sakimoto *et al.* offer an alternative by showing that the acetogenic bacterium *Moorella thermoacetica* can use cadmium sulfide (CdS) nanoparticles to harvest electrons from sunlight, instead of H_2, to produce acetate. Growing *M. thermoacetica* in the presence of cadmium and cysteine led to the precipitation of CdS nanoparticles that coated the surface of the bacterium. These nanoparticles enabled the bacterium to use sunlight as an electron source to reduce CO_2, resulting in the production of acetate. Notably, this strategy can sustain bacterial growth and has a high yield, with approximately 90% of the electrons being directed towards acetate production.

ORIGINAL ARTICLE Sakimoto, K. K., Wong, A. B. & Yang, P. Self-photosensitization of nonphotosynthetic bacteria for solar-to-chemical production. *Science* **351**, 74–77 (2016)

ANTIMICROBIALS

How to keep your wall up

Several antibiotics interfere with the enzymes that are involved in the synthesis and assembly of the bacteria cell wall, inducing cell lysis. Dörr *et al.* now report a novel stress response system used by *Vibrio cholerae* to counteract these effects. Using a transposon-based screen, they identified the sensor kinase–response regulator pair WigKR as necessary for tolerance to penicillin. Notably, WigKR was activated in response to cell wall damage induced by multiple antibiotics, and overexpression of WigR resulted in the upregulation of several genes involved in cell wall synthesis, including the entire peptidoglycan biosynthesis pathway. Furthermore, WigR seems to regulate cell length and volume, even in the absence of antibiotics. Although the signal responsible for the activation of WigKR remains to be identified, these data suggest that this two-component system controls cell wall homeostasis both during normal growth and in response to antibiotic exposure.

ORIGINAL ARTICLE Dörr, T. *et al.* A cell wall damage response mediated by a sensor kinase/response regulator pair enables beta-lactam tolerance. *Proc. Natl Acad. Sci. USA* http://dx.doi.org/10.1073/pnas.1520333113 (2015)

ARCHAEAL PHYSIOLOGY

Bridging the gaps in sulfur reduction

Marine archaea and bacteria that can carry out dissimilatory reduction of sulfate to sulfide (DSR) have a central role in sulfur cycles. A key step in this pathway is the reduction of a high-energy sulfite intermediate to sulfide, which is mediated by the dissimilatory sulfite reductase DsrAB. However, none of the enzymes involved in the DSR pathway is membrane-bound and thus cannot generate an electrochemical gradient, so how sulfite reduction is coupled to energy conservation is unknown. Now, Santos, Venceslau *et al.* report that sulfite reduction by an archaeal DsrAB involves another protein, DsrC, which interacts with DsrAB and uses a sulfite-derived sulfur to bridge two of its cysteines. This reaction forms a trisulfide intermediate that is then probably reduced to sulfide by the membrane-bound DsrMKJOP complex. This complex has previously been shown to interact with DsrC and may use the electrons released during the reduction of the trisulfide intermediate to generate a transmembrane proton gradient that enables energy conservation.

ORIGINAL ARTICLE Santos, A. A., Venceslau, S. S. *et al.* A protein trisulfide couples dissimilatory sulfate reduction to energy conservation. *Science* **350**, 1541–1545 (2015)