IN BRIEF

BACTERIAL PHYSIOLOGY

Stress makes cells suicidal

Like eukaryotic cells, bacteria can undergo programmed cell death under stress conditions, according to a new study. The authors observed that treatment of *Escherichia coli* cells with antibiotics resulted in the induction of key signs of apoptosis, the most common type of programmed cell death. These included DNA fragmentation, chromosome condensation and exposure of phosphatidylserine on the membrane. Importantly, stress conditions led to the induction of a protein with similar substrate specificity to caspases, the enzymes that orchestrate apoptosis in eukaryotic cells. This protein was shown to be the bacterial regulator RecA; further analysis indicated that RecA has to be cleaved by the protease ClpP to bind to its substrates and that it is required for DNA fragmentation and phosphatidylserine exposure. These observations provide important insights into the evolution of apoptosis, suggesting that it was the tight control of programmed cell death, rather than the ability to undergo the process, that accompanied the evolution of multicellular organisms.

ORIGINAL RESEARCH PAPER Dwyer, D. J. *et al.* Antibiotic-induced bacterial cell death exhibits physiological and biochemical hallmarks of apoptosis. *Mol. Cell* 24 May 2012 (doi:10.1016/j.molcel.2012.04.027)

SYMBIOSIS

Ants and fungi stay faithful

It had previously been proposed that fungus-growing ants and their fungal cultivars are diffusely associated — that is, the two partners are not exclusively associated with each other. However, this study suggests that this is not the case. By examining the relationship between fungal cultivars and four ant species in North, Central and South America, the authors found that each ant species has been exclusively associated with one fungal cultivar lineage over millions of years. Moreover, analysis of these relationships suggested that rare shifts in cultivar association are linked to ant speciation.

ORIGINAL RESEARCH PAPER Mehdiabadi, N. J. *et al.* Symbiont fidelity and the origin of species in fungus-growing ants. *Nature Comm.* **3**, 840 (2012)

ANTIMICROBIALS

S-layers to the rescue

The cell walls of bacteria and archaea are covered with paracrystalline surface layers (S-layers) that are mainly composed of proteins and glycoproteins. Although the S-layers of some bacteria have been shown to have roles in virulence, adhesion and protection, the function of most S-layers was largely unclear. Here, the authors postulated that, because S-layers have been conserved throughout evolution, they must have a role in bacterial survival and in particular in protection against exogenous stresses such as antimicrobial peptides (AMPs). Indeed, they observed that cells carrying S-layers were more resistant to killing by AMPs than those that did not, and this was true when bacteria were grown in biofilms or in suspension. Furthermore, S-layers offered the highest level of protection against a cationic AMP, whereas there was no significant protective effect against negatively charged AMPs. Together, these findings suggest that S-layers have evolved as a key resistance mechanism in bacteria, protecting cells from cationic AMPs through charge interactions.

ORIGINAL RESEARCH PAPER de la Fuente-Núñez, C. *et al.* Bacterial surface layer protects against antimicrobial peptides. *Appl. Environ. Microbiol.* 25 May 2012 (doi:10.1128/AEM.01493-12)