IN BRIEF

ANTIMICROBIALS

Bacterial charity work leads to population-wide resistance

Lee, H. H. *et al. Nature* **467**, 82–85 (2010)

James Collins and colleagues tracked the response of a continuous culture of *Escherichia coli* str. MG1655 to increasing concentrations of norfloxacin over 10 days, determining the minimum inhibitory concentration (MIC) of the population and of individual isolates daily. Compared with the population MIC, most isolates showed lower resistance (less resistant isolates; LRIs) but there were a few isolates in which resistance was greater (highly resistant isolates; HRIs). The authors found that the HRIs were secreting the stress metabolite indole into the culture medium and that this could protect the LRIs from antibiotic stress. They went on to show that indole fulfills this protective function by upregulating efflux pump expression and activating mechanisms known to protect against oxidative stress. So, under antibiotic stress a small number of spontaneous drug-resistant mutants can enhance the survival of the overall population in a mechanism similar to kin selection.

MICROBIAL ECOLOGY

Reshaping the gut microbiome with bacterial transplantation and antibiotic intake

Manichanh, C. *et al. Genome Res.* 24 Aug 2010 (doi:10.1101/gr.107987.110)

An imbalance in the composition of the microbiota has been linked to disorders such as inflammatory bowel diseases. Manichanh *et al.* were interested in observing the response of the intestinal microbiota to experimental perturbation. Using a rat model system, they studied the effects of antibiotic treatment and of transplantation of exogenous caecal contents with and without antibiotic pretreatment. Treatment with vancomycin and imipenem for 3 days led to a tenfold decrease in bacterial load. The authors speculated that using antibiotic pretreatment to reduce the overall bacterial load before caecal transplantation would facilitate the establishment of the exogenous microbiota, but this was not the case. Instead, transplantation after antibiotic pretreatment resulted in a greater reshaping of the microbiota than occurred with antibiotic treatment or caecal transplant alone.

SYMBIOSIS

Anaplasma phagocytophilum induces *Ixodes scapularis* ticks to express an antifreeze glycoprotein gene that enahances survival in the cold

Neelakanta, G. *et al. J. Clin. Invest.* **120**, 3179–3190 (2010)

The black-legged tick *Ixodes scapularis* is the vector for many bacterial pathogens, including *Anaplasma phagocytophilum*. *I. scapularis* must be able to withstand the freezing conditions found in the Northeast and Upper Midwest of the United States in the winter. Neelakanta *et al.* found that *A. phagocytophilum*-infected *I. scapularis* had longer survival times during cold shock (–20 °C) than non-infected ticks, and survival was correlated with bacterial burden. Arthropods undergo various behavioural modifications to survive low temperatures, including the production of antifreeze glycoproteins (AFGPs). The authors identified an AFGP-encoding gene in *I. scapularis* and showed that *A. phagocytophilum* infection induced the expression of this gene, thereby enhancing the cold tolerance of *I. scapularis*, which, in turn, enhances *A. phagocytophilum* survival.