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IN BRIEF

ANTIMICROBIALS

When synergism back-fires

It is generally assumed that the combination of two synergistic antibiotics is more effective for the treatment of bacterial infections than a single drug. A new study challenges this view by showing that synergism can actually select for higher bacterial loads owing to strong selection pressure for the rapid evolution of resistant bacteria. Mathematical modelling predicted that short-term aggressive treatment with two antibiotics could theoretically maximize bacterial numbers later in infection by eliminating drug-susceptible competitor bacteria. Consistent with this, *in vitro* evolution of *Escherichia coli* grown in the presence of erythromycin and doxycycline showed that the more aggressive the treatment, the higher the resulting bacterial loads; this was found to be due to rapid selection of resistant bacteria carrying an amplification of the genomic region containing the *acrAB* efflux operon (which confers multidrug resistance). These findings suggest that unless synergism clears the infection before efficient selection of resistant mutants, it might actually be the worst strategy for treatment.

ORIGINAL RESEARCH PAPER Pena-Miller, R. *et al.* When the most potent combination of antibiotics selects for the greatest bacterial load: the smile-frown transition. *PLoS Biol.* **11**, e1001540 (2013)

FUNGAL PATHOGENESIS

Sugar-coating virulent *Candida albicans*

The cell wall of the opportunistic fungal pathogen *Candida albicans* contains an outer layer incorporating heavily glycosylated mannan proteins, which are crucial for immune recognition by the host. In this study, the functional roles of the Mnn2 family of α1,2-mannosyltransferases (Mnn2, Mnn21, Mnn22, Mnn23, Mnn24 and Mnn26), which are responsible for the synthesis of *N*-mannan outer chains, were assessed. Single, double, triple, quintuple and sextuple knockout mutants all showed reduced cell wall integrity. Furthermore, the enzymes proved to be important in determining mannan microfibril length: the *MNN2 MNN26* double mutant had shortened mannoprotein fibrils, whereas the sextuple mutant was almost completely devoid of long fibrils. These changes correlated with reduced virulence in both mice and moth larvae, highlighting the pivotal role of α1,2-mannosyltransferases in *C. albicans* pathogenesis.

ORIGINAL RESEARCH PAPER Hall, R. A. *et al.* The Mnn2 mannosyltransferase family modulates mannoprotein fibril length, immune recognition and virulence of *Candida albicans*. *PLoS Pathog.* **9**, e1003276 (2013)

TECHNIQUES AND APPLICATIONS

A close-up of magnetotactic bacteria

Magnetotactic bacteria use magnetic crystal-containing organelles (magnetosomes) to migrate along magnetic fields. Using a custom-built fluorescence microscope that combines bright-field optical and magnetic resonance imaging, the first images of magnetosomes in live *Magnetospirillum magneticum* cells have now been captured. Each *M. magneticum* cell was found to contain several magnetic nanoparticles arranged in chains that generated an average magnetic field of 5×10^{-17} Am^2, consistent with previous measurements using magnetic trapping. This new technology will enable real-time imaging of nanoparticle growth in developing cells and of magnetosome chain movement during cell division.

ORIGINAL RESEARCH PAPER Le Sage, D. *et al.* Optical magnetic imaging of living cells. *Nature* **496**, 486–490 (2013)

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