IN BRIEF

CELLULAR MICROBIOLOGY

Phospholipid export from the inside out

The outer membrane of Gram-negative bacteria is asymmetric, with phospholipids in the inner leaflet and lipopolysaccharides in the outer leaflet. Although the lipid asymmetry (Mla) pathway has been implicated in trafficking phospholipids between the inner and outer membranes via retrograde transport, the directionality and mechanism of phospholipid transport was not well understood. The pathway is composed of the outer membrane MlaA–OmpC–OmpF complex, a soluble periplasmic protein, MlaC, and the inner membrane ATPase, MlaFEDB complex. Knowles and colleagues now provide evidence that the inner-membrane MlaFEDB complex, in particular the MlaD component, extracts phospholipids from the inner membrane and transfers them to MlaC in a manner independent of ATP. The data suggest that the Mla pathway may be involved in anterograde phospholipid transport to the outer membrane.

ORIGINAL ARTICLE Hughes, G. W., Hall, S. C. L., Laxton, C. S., Sridhar, P. et al. Evidence for phospholipid export from the bacterial inner membrane by the Mla ABC transport system. *Nat. Microbiol.* https://doi.org/10.1038/s41564-019-0481-y (2019)

MICROBIOME

Jumping from well to well

DNA sequence-based studies have greatly advanced the microbiome field. However, contamination from reagents or laboratory kits can lead to biased results and impedes reproducibility. Knight and colleagues now show that cross-contamination between samples in 96-well plates occurs at high frequencies. Contamination occurred mainly during DNA extraction rather than during the PCR step, and plate-based methods had more well-to-well contamination compared with manual single tube extractions. Furthermore, well-to-well contamination was more prominent in samples with lower microbial biomass. Cross-contamination can lead to the introduction of additional bacteria to samples and thus affect diversity estimation. The findings also have implications for the approach of removing 'background contaminants' in negative controls during the analysis of sequencing results, as taxa that actually occur in the samples might be missed.

ORIGINAL ARTICLE Minich, J. J. et al. Quantifying and understanding well-to-well contamination in microbiome research. *mSystems* https://doi.org/10.1128/mSystems.00186-19 (2019)

ANTIMICROBIALS

An intracellular drug reservoir

Mycobacterium tuberculosis, the causative agent of tuberculosis, infects and multiplies within mammalian macrophages. Greenwood et al. investigated the intracellular distribution of the lipophilic tuberculosis drug bedaquiline (BDQ) in infected human macrophages. BDQ accumulated heterogeneously in *M. tuberculosis* within macrophages, and the antibiotic was also enriched in host lipid droplets. Previous studies have shown that *M. tuberculosis* consumes host lipid droplets. Indeed, the authors showed extensive physical contacts between lipid droplets and the bacteria, and that following an initial increase of lipid droplets in the presence of the bacteria, consumption reduced the number of the host organelles 48 h post infection. Moreover, they found that the BDQ pool in lipid droplets can be transferred to bacteria. Thus, lipid droplets may provide a BDQ reservoir rather than sequester the drug, and enhance drug efficacy as the bacteria consume them.

ORIGINAL ARTICLE Greenwood, D. J. et al. Subcellular antibiotic visualization reveals a dynamic drug reservoir in infected macrophages. *Science* **364**, 1279–1282 (2019)

VACCINES

Debunking science deniers

Science denialism questions scientific facts and spreads misinformation about topics such as vaccination and climate change. Effective strategies of how to counter the arguments of a science denier are urgently needed. A new study by Schmid and Betsch tested different approaches to mitigate the effect of science denialism in a public debate about vaccination.

The authors write that "being in a public debate with a science denier […] may seem like an endless universe of potential misinformation." However, the arguments of science deniers can be grouped into five classes of techniques, such as conspiracy theories or impossible expectations, and five classes of topics, such as lack of safety or efficacy. There are two basic options of how to counter these arguments: refute the technique used to make the argument or refute the topic with scientific facts.

For example, if a science denier questions the use of vaccines because they are not 100% safe, a technique rebuttal is to call them out about the false expectation of absolute safety. A topic rebuttal would be to describe the safety standards of vaccines and the higher safety of vaccinating versus not vaccinating. The authors now tested these two approaches in five online experiments in which participants either listened to or read a debate with a vaccination denier and then measured the attitude towards vaccination and the intention to vaccinate.

Overall, science denialism had a negative effect on the audience, in particular when no science advocate was present, and the effect was strongest in vulnerable people who already had low confidence in vaccination before the experiment. Both technique and topic rebuttals mitigated the negative effect and, encouragingly, were most effective in the vulnerable subpopulation.

BACTERIAL PHYSIOLOGY

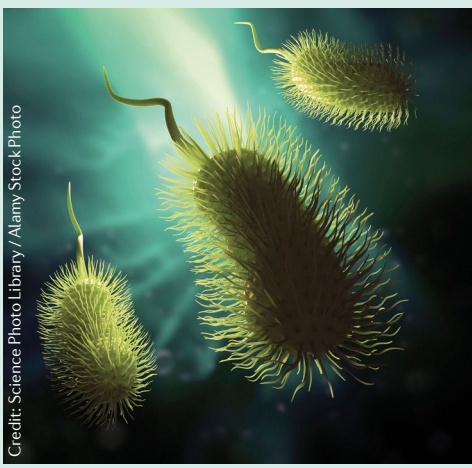
What's the best bacterial shape?

Bacteria exist in different shapes, ranging from cocci, straight or curved rods to complex forms, such as corkscrews or clubs.

Bacteria have likely adapted their shape to suit their particular niche and/or lifestyle. However, little is known about the specific factors that determine why bacteria are shaped in a particular way. A new study combined images of 4,903 bacterial cells with supercomputing simulations to answer this question.

Many bacteria are curved rods, and this morphology is common in environments such as the ocean. Nevertheless, previous work has found that the most efficient shape for a swimming bacterium is similar to a rugby ball and not a rod, leading the authors to hypothesize that evolutionary trade-offs between several different tasks underlie the ubiquitous curved rod shape.

The authors searched the literature for micrographs of free-swimming curved rods and measured their elongation and



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