

IN BRIEF

VACCINES

Make it personal to beat vaccine hesitancy

Vaccine hesitancy is multifactorial and difficult to address. In this randomized controlled trial, Freeman et al. recruited over 18,000 adults in the UK and assessed their willingness to be vaccinated against COVID-19. Around 10% of participants were strongly hesitant, questioning the safety and benefit of vaccination. Participants were randomized to 10 different information types, ranging from messaging highlighting the public benefit to addressing concerns about the speed of development. The most effective message for reducing vaccine hesitancy was explaining the personal benefits of vaccination, including prevention of serious illness and long-term health problems, although the effect was relatively small. Of note, the overall willingness of people to get vaccinated had increased substantially since a previous similar study that was conducted in October 2020 compared to the current study, which was conducted in February 2021.

ORIGINAL ARTICLE Freeman, D. et al. Effects of different types of written vaccination information on COVID-19 vaccine hesitancy in the UK (OCEANS-III): a single-blind, parallel-group, randomised controlled trial. *Lancet Public Health* [https://doi.org/10.1016/s2468-2667\(21\)00096-7](https://doi.org/10.1016/s2468-2667(21)00096-7) (2021)

EPIDEMIOLOGY

Tracking down polyclonal tuberculosis

Tuberculosis can be difficult to treat owing to drug resistance, persistence of bacteria and/or reinfection. All of these challenges can be compounded if a patient is infected with several different strains of *Mycobacterium tuberculosis*. To find out how common polyclonal infection is, Moreno-Molino et al. sequenced samples from 18 patients who had tuberculosis lesions surgically removed. 39% of the patients showed signs of polyclonal infection. By contrast, sequencing of sputum samples of 218 patients (all from Georgia, the same as the surgical patients, which has a high incidence of tuberculosis) detected a polyclonal infection only in 5%, which suggests that sputum samples can be insufficient for the diagnosis of polyclonal infection and that reinfection might be more common than previously thought. Importantly, a large part of the surgical patients with polyclonal infection harboured strains with differing drug resistance, which will complicate drug treatment.

ORIGINAL ARTICLE Moreno-Molina, M. et al. Genomic analyses of *Mycobacterium tuberculosis* from human lung resections reveal a high frequency of polyclonal infections. *Nat. Commun.* **12**, 2716 (2021)

RELATED ARTICLE Meehan, C. J. et al. Whole genome sequencing of *Mycobacterium tuberculosis*: current standards and open issues. *Nat. Rev. Microbiol.* **17**, 533–545 (2019)

CLINICAL MICROBIOLOGY

POCT for drug-resistant gonorrhoea

Sexually transmitted diseases are on the rise and drug resistance is increasing, in particular for *Neisseria gonorrhoeae*. Trick et al. present a point-of-care test (POCT), which can rapidly and cost effectively detect *N. gonorrhoeae* and assess its sensitivity to the antibiotic ciprofloxacin. They used a magnetofluidic PCR test using magnetic beads and cartridges, which can be linked to a smartphone application for result reporting. Within 15 minutes, the test amplifies *opa* (encoding a cell surface protein) and wild-type *gyrA* (encoding the ciprofloxacin target). Importantly, when used in sexual health clinics in Baltimore, USA and Kampala, Uganda, on samples of over 200 patients, the test showed a specificity and sensitivity of over 97%.

ORIGINAL ARTICLE Trick, A. Y. et al. A portable magnetofluidic platform for detecting sexually transmitted infections and antimicrobial susceptibility. *Sci. Transl. Med.* **13**, eabf6356 (2021)

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MICROBIAL ECOLOGY

Bacteria on the hunt

Microbial predators, ranging from phages to protists, prey on other microorganisms, and are important regulators of food webs and nutrient cycles. Bacterial predators are less well understood than other microbial predators, in particular, their ecological functions. In a new study, Hungate et al. measured the growth rates of predatory bacteria in different environments and showed that they respond to nutrient addition, which is indicative of their role in controlling the base of the food web.

There are facultative predatory bacteria, such as members of the genera *Lysobacter* and *Cytophaga*, that can hunt in 'packs', similar to wolves, but that can also assume a saprotrophic life style. By contrast, obligate predatory bacteria, such as members of the genera *Vampirovibrio* and *Bdellovibrio*, rely on predation to survive, for example, by 'sucking' cytoplasm out of prey cells for the former or by 'eating' them from the inside for the latter. To assess the ecological roles of these bacterial predators, Hungate et al. studied 14 different soil sites, ranging from the arctic to the tropics, and one temperate stream with quantitative stable isotope probing (qSIP).

The authors used ¹³C-labelled organic matter and/or ¹⁸O-labelled water to measure the incorporation of carbon and oxygen into DNA, respectively. 16S rRNA sequencing then can be used to identify the taxa. Overall, only 7% of the bacterial taxa detected were known predators and of those, only 8% were obligate predators. However, despite accounting

for only a minor part of the overall bacterial diversity, predatory bacteria across sites and experiments incorporated isotopic tracers at rates of almost a quarter higher than non-predatory bacteria. The obligate predatory order Vampirovibrionales had the highest rates of isotope tracer incorporation, followed by the facultative predatory genus *Lysobacter*.

Overall, the growth rate of facultative predators was only slightly higher than that of non-predators, whereas obligate predators showed substantially higher growth rates and carbon uptake than non-predators. Furthermore, their growth was strongly stimulated by the addition of carbon substrates or combined carbon and nitrogen substrates, whereas non-predators and facultative predators showed only a small increase of growth when those nutrients were more abundant. Together these results indicate that bacterial predators are important for top-down control of food webs and that added resources disproportionately flow to the predator trophic level after assimilation by heterotrophic bacteria, who then serve as prey.

In summary, the study shows that predatory bacteria are metabolically more active than other members of environmental microbiomes and that they have important roles in regulating nutrient fluxes in microbial food webs.

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ORIGINAL ARTICLE Hungate, B. et al. The functional significance of bacterial predators. *mBio* **12**, e00466-21 (2021)