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IN BRIEF

MICROBIOME

Gut bacteria feed a healthy brain

The tissue macrophages of the central nervous system (CNS), known as microglia, are essential for normal brain development and maintenance of the innate immune response of the CNS; however, the factors that control their maturation and activation have been unclear. Now, Erny *et al.* show that the intestinal microbiota has a major influence on the number, maturation and function of microglial cells in mice. Defects in the maturation and differentiation of microglia were observed both following eradication of the gut microbiota and in the presence of a microbial community of reduced complexity, whereas recolonization with a complex microbiota largely restored these defects. The authors find that short-chain fatty acids (SCFAs) produced by the microbiota function as mediators between the gut and the brain, as treatment of germ-free mice with a mixture of SCFAs reversed microglial impairments and mice deficient in the SCFA receptor FFAR2 exhibited similar defects to germ-free animals.

ORIGINAL RESEARCH PAPER Erny, D. *et al.* Host microbiota constantly control maturation and function of microglia in the CNS. *Nat. Neurosci.* https://dx.doi.org/10.1038/nn.4030 (2015)

BACTERIAL PHYSIOLOGY

Type IV pili function as mechanosensors

Bacteria use a range of sensory systems to mount appropriate responses to their environment. A new study now shows that the opportunistic pathogen *Pseudomonas aeruginosa* uses its type IV pili (which are composed of pilin subunits and are mainly used for surface motility) to sense contact with a surface and trigger a downstream signalling cascade that regulates virulence. The authors find that the process of pilus attachment and retraction functions as a mechanical cue that activates the Chp chemosensory system, thereby regulating the transcription of several important virulence factors. Notably, signal transduction is mediated by direct interactions between the major pilin subunit PilA and the chemosensor PilJ. These findings reveal a novel function for type IV pili that is probably important for promoting prolonged surface attachment and biofilm formation.

ORIGINAL RESEARCH PAPER Persat, A. *et al.* Type IV pili mechanochemically regulate virulence factors in *Pseudomonas aeruginosa*. *Proc. Natl Acad. Sci. USA* https://dx.doi.org/10.1073/pnas.1502025112 (2015)

VIRAL EVOLUTION

Global patterns of influenza circulation

Understanding the factors that influence the circulation of seasonal influenza viruses is a major public health challenge. By analysing 9,604 viral haemagglutinin (HA) sequences from the 2 influenza A subtypes H1N1 and H3N2, and the 2 influenza B viruses Yamagata and Victoria (all of which cause annual epidemics), Bedford *et al.* now show that the global circulation patterns of these viruses differ considerably. H1N1 and the two influenza B viruses persist locally between epidemics, whereas H3N2 viruses tend to be more widespread globally but die out between epidemics. Interestingly, H1N1 and the influenza B viruses showed slower rates of HA evolution compared with H3N2 viruses. Modelling suggests that because H1N1 and influenza B viruses evolve more slowly and mainly infect children, whereas H3N2 viruses evolve rapidly and infect individuals of all ages, the less frequent travel of children may be a factor that limits the global spread of H1N1 and influenza B viruses.

ORIGINAL RESEARCH PAPER Bedford, T. *et al.* Global circulation patterns of seasonal influenza viruses vary with antigenic drift. *Nature* https://dx.doi.org/10.1038/nature14460 (2015)