IN BRIEF

HOST RESPONSE

RNAi: challenging the dogma

In antiviral RNA interference (RNAi), virus-derived double-stranded RNA is processed by the endoribonuclease DICER into 21–23 nucleotide small interfering RNAs (siRNAs) that guide ARGONAUTE proteins to silence complementary viral RNA. As a counter-strategy, viruses express viral suppressors of RNAi (VSRs). The role of RNAi in host defence against viral infection in plants and invertebrates has been known for many years, but an antiviral role for RNAi has never been identified in mammalian cells, with the dogma being that mammalian cells rely instead on the type I interferon response for antiviral defence. Two new papers now provide evidence to challenge this dogma. Using deep sequencing and northern blot analysis, Maillard and colleagues identified abundant 21–23 nucleotide RNAs with characteristics that were distinctive of DICER processing in undifferentiated mouse embryonic stem cells (mESCs) infected with encephalomyocarditis virus (EMCV). By contrast, these RNAs were absent in infected mESCs that lacked DICER. To assess whether these RNAs had antiviral activity, the authors used Nodamura virus (NoV), as it has a well-characterized VSR (the B2 protein). They found that infection of mESCs with a NoV mutant that lacked B2 (NoVΔB2), but not with wild-type NoV, generated 21–23 nucleotide siRNAs that were indicative of DICER processing. Liu and colleagues also studied the effects of NoV infection and found that infection of somatic (BHK-21) cells with NoVΔB2, but not with wild-type NoV, generated 21–23 nucleotide RNAs that had properties consistent with canonical siRNAs. These authors went on to study the effects of NoV infection in suckling mice and found that a NoVΔB2 infection was cleared much more rapidly than a wild-type NoV infection. Northern blot analysis showed that NoVΔB2 clearance was associated with the production of abundant ~22 nucleotide RNAs. However, the debate may not be over yet as, in a third study published around the same time, Seo and colleagues showed that the activation of essential components of the type I interferon response in somatic cells attenuates the antiviral activity of RNAi. In contrast to its direct role in blocking viral replication in plants and invertebrates, they suggest that RNAi mainly functions as a negative regulator of the antiviral interferon response in mammalian cells.

ORIGINAL RESEARCH PAPERS Li, Y. *et al.* RNA interference functions as an antiviral immunity mechanism in mammals. *Science* **342**, 231–234 (2013) | Maillard, P. V. *et al.* Antiviral RNA interference in mammalian cells. *Science* **342**, 235–238 (2013) | Seo, G. J. *et al.* Reciprocal inhibition between intracellular antiviral signaling and the RNAi machinery in mammalian cells. *Cell Host Microbe* **14**, 435–445 (2013)

TECHNIQUES & APPLICATIONS

Bacteria in 3D

Connell and colleagues report the development of a multiphoton lithography-based three dimensional (3D) printing technique that enables the encapsulation of viable bacteria within microscopic gelatin-based sealed microcontainers. The bacteria are physically segregated from bacteria in other microcontainers but can still chemically communicate with them. This technique allows defined polymicrobial communities to be constructed in a limitless variety of 3D geometrical arrangements and will enable the sociomicrobiological interactions within these communities to be studied at an unprecedented level of detail.

ORIGINAL RESEARCH PAPER Connell, J. L. *et al.* 3D printing of microscopic bacterial communities. *Proc. Natl Acad. Sci. USA* http://dx.doi.org/10.1073/pnas.1309729110 (2013)