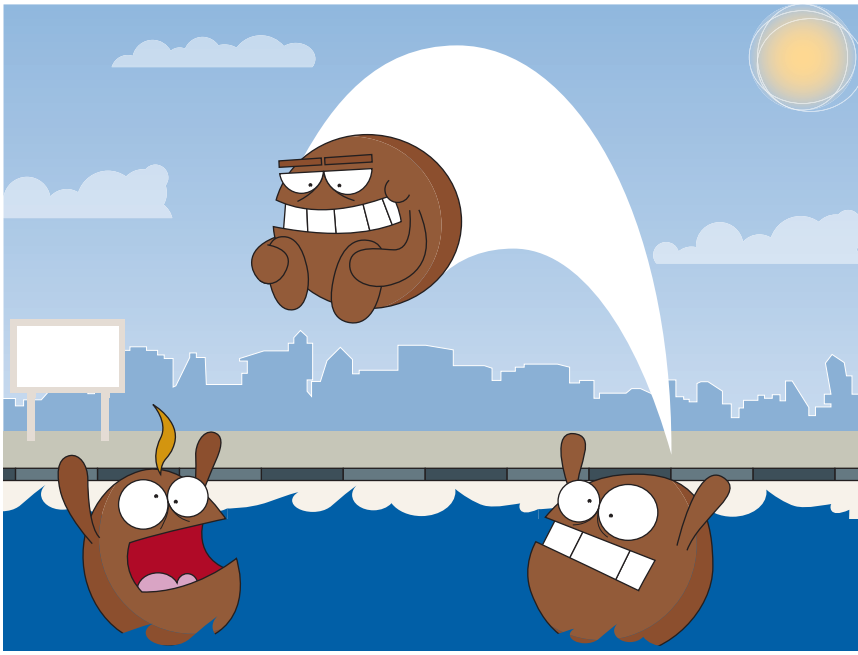
MICROBIAL ECOLOGY

Type III secretion systems: jumping into the reservoir

Increasing evidence suggests that free-living protozoans, such as amoebae, are important environmental reservoirs for foodborne pathogens, but how the bacteria infect and survive in protozoan hosts is unclear. A recent study published in *Applied Environmental Microbiology* suggests that type III secretion systems (T3SSs) hold the key.

Salmonella enterica serovars have been shown to survive and proliferate in amoebae. Bleasdale and colleagues investigated whether two *S. enterica* T3SSs that are known to be involved in survival in mammalian cells have similar roles when these bacteria infect amoebae. These secretion systems are T3SS-1 and T3SS-2, which are encoded by *Salmonella* pathogenicity island 1 (SPI-1) and SPI-2, respectively. Variants of *Salmonella enterica* subsp. *enterica* serovar Typhimurium were used that carried mutations for the SPI-1 gene *spaS*, the SPI-2 gene *ssaU* or the *phoP* gene, which encodes a component of a two-component regulatory system that functions together with T3SS-2 to promote survival in mammalian cells.

The authors monitored the uptake and survival of these *S. enterica* strains into the amoeba *Acanthamoeba polyphaga*. The *spaS* mutant was recovered from lysed amoebal cells at similar levels to a wild-type strain at all time points after infection. By contrast, the *ssaU* and *phoP* mutants were recovered at significantly lower levels, with a decline over time in the number of viable bacteria. These results suggest that T3SS-2, but not T3SS-1, is required for *S. enterica* survival in amoebae. In support of this conclusion, the authors used real-time RT-PCR (PCR after reverse transcription of RNA) to show that a key SPI-2 gene undergoes a dramatic increase in transcription 4 hours after infection, whereas its SPI-1 counterpart shows only a transient increase.



NEIL SMITH

As well as the implications for understanding how bacterial pathogens infect and survive in protozoan reservoirs, this study raises an interesting evolutionary possibility: did mechanisms that have been considered primarily in terms of virulence with respect to animal hosts in fact originate to allow survival in different organisms?

Louisa Flintoft, Chief Editor, Nature Reviews Genetics

ORIGINAL RESEARCH PAPER Bleasdale, B. *et al.* The *Salmonella* pathogenicity island (SPI)-2 -encoded type III secretion system is essential for survival of *Salmonella enterica* serovar *Typhimurium* in free-living amoebae. *Appl. Environ. Microbiol.* 23 Jan 2009 (doi:10.1128/AEM.02033-08)