



IMAGESOURCE

 ARCHAEA

## Viral exclusion order

Little is known about the interplay between extrachromosomal genetic elements that reside in archaea. In a paper published in *Molecular Microbiology*, Peng and colleagues have identified a conjugative plasmid resident in *Acidianus hospitalis* strain W1 that is selectively lost following infection by *Acidianus* filamentous virus 1 (AFV1).

Given our detailed understanding of plasmid–phage interactions that occur in bacteria, in which conjugative plasmids are either required for, or confer resistance to, viral infection, it is surprising that nothing is known about the interplay of these elements in archaea. This is despite the identification of 8 conjugative plasmids, 30 cryptic plasmids and about 50 different viruses in the 2 main archaeal phyla (Euryarchaeota and Crenarchaeota).

While studying replication of the lipothrixvirus AFV1 in *A. hospitalis*,

Peng and colleagues detected a 28 kb circular DNA species (pAH1) — the first conjugative plasmid to be identified in the crenarchaeal genus *Acidianus* — with homology to conjugative plasmids from *Sulfolobus* species. pAH1 contained 39 open reading frames, many of which are likely to be involved in conjugative transfer of the plasmid. PCR analyses showed that pAH1 could both integrate into, and excise out of, the genome. Both integrated and extrachromosomal forms were stably maintained in *A. hospitalis* cells grown for 100 generations, suggesting there is a dynamic equilibrium between the integrated and excised states.

The authors infected *A. hospitalis* cells with AFV1 and then followed the relative proportions of viral DNA and pAH1. Surprisingly, they found that infection with AFV1 led to loss of the extrachromosomal form of pAH1 from the cells, whereas the integrated

form was maintained intact. The disappearance of extrachromosomal pAH1 correlated with increased viral replication, which might indicate that competition for a common factor during the replication of these elements could underlie plasmid exclusion.

This is the first time that infection by a virus has been shown to affect an endogenous conjugative plasmid in either bacterial or archaeal systems. Furthermore, in more than 300 *Sulfolobus* isolates surveyed, no single isolate was found to contain both a conjugative plasmid and a virus, suggesting that this mechanism might be conserved among archaeal species in the environment.

Andrew Jermy

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...disappearance of extrachromosomal pAH1 correlated with increased viral replication...

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**ORIGINAL RESEARCH PAPER** Basta, T. et al. Novel archaeal plasmid pAH1 and its interactions with the lipothrixvirus AFV1. *Mol. Microbiol.* 10 Nov 2008 (doi:10.1111/j.1365-2958.2008.06488.x)