Review of: "The importance of biofilm formation for cultivation of a Micrarchaeon and its interactions with its Thermoplasmatales host"

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In this article, the authors report exciting findings about cultivating two archaeal microorganisms whose symbiotic relationship appears to require biofilm formation. This work is relevant to enhancing our understanding of members of DPANN, a tentative superphylum of nano-sized archaea, which are widely distributed in nature and present in diverse microbial communities. Interestingly, most DPANN archaea have reduced genomes, limited metabolic capabilities, and rely on interactions with their hosts for survival. The challenge for better understanding the biology and cell physiology of these archaea and the nature of their interactions is that these organisms are notoriously difficult to grow in co-cultures in the laboratory.

In this publication, the authors report their results about the enrichment, co-cultivation, and interactions of a new Micrarchaeon (*Ca*. Micrarchaeum harzensis) with a previously unknown member of the *Thermoplasmatales* (*Ca.* Scheffleriplasma hospitalis). The authors used clever cell culture selection strategies to deselect against other potential host organisms and demonstrate that biofilm formation is critical to obtain stable *Ca*. Micrarchaeum harzensis- *Ca.* Scheffleriplasma hospitalis co-cultures. Several observations about the nature of the interactions between these two archaea are reminiscent of what has been reported regarding the interactions of *Nanoarcheum equitans* with *Ignococcus hospitalis*, but there are also some very interesting differences. Results from the authors' Cryo-ET microscopy and transcriptomics analyses suggest that *Ca.* Scheffleriplasma hospitalis might initiates interactions with *Ca*. Micrarchaeum harzensis by forming a biofilm, and changes in the biofilm EPS (extracellular polymeric substances) composition could facilitate attachment of the symbiont. It does not appear that the growth of the host benefits or is harmed by the attachment of *Ca*. Micrarchaeum harzensis to *Ca.* Scheffleriplasma hospitalis.

This work is exciting and highlights the importance of studying such organisms, which are challenging to grow as stable co-cultures. The study is elegant and highlights a clear need to enhance our understanding of the diversity of symbiont-host interactions involving DPANN archaeal members, and of their role in ecological communities. The prevalence of such microorganisms in the environment attests to their important ecological role and biological significance.