Consiglio Nazionale delle Ricerche

ISTITUTO DI SCIENZE POLARI

ANNUNCIO SEMINARIO

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Abstracts

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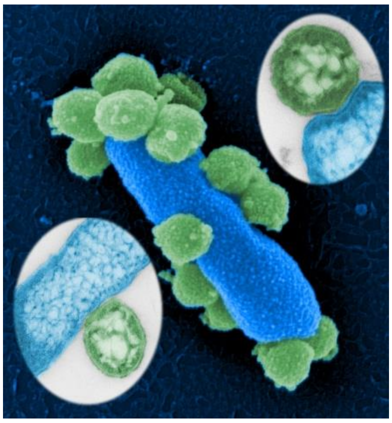
POSTGENOMIC FUNCTIONAL ANALYSIS OF NANOHALOARCHAEA: HALOARCHAEA ASSOCIATIONS

One of the most important recent discoveries in archaeal biodiversity is the characterization of many, globally distributed nanosized organisms (typically < 500 nm), most of which belong to the candidate archaeal "DPANN" superphylum. This superphylum (named after the first members of this group, **D**iapherotrites, **P**arvarchaeota, **A**enigmarchaeota, **N**anoarchaeota and **N**anohaloarchaeota) now includes at least ten distinct archaeal phyla. Most DPANNs have a small genome (usually < 1Mb) and limited metabolic capabilities, which leading to the suggestion that many of them are symbiotic. Although comparative analysis of their genomes is generally not sufficient to accurately elucidate the ecological and genetic strategies used by the archaeal host and its symbiont.



Unfortunately, only a few DPANN archaea are grown in the laboratory, usually in binary or mixed cultures, and the main questions regarding cell physiology and metabolism, as well as the nature of the association of DPANN nano-organisms with their hosts, remain unclear. These few successful examples of stable maintenance of DPANN members in co-culture showed that they are all largely parasitic endosymbionts rather than syntrophic partners, that negatively affect the growth of the host by stealing various substrates, such as lipids, amino acids, nucleotides, and cofactors, which they cannot synthesize themselves. The only exception was our work[1], which describes intimate interactions between cultivated *Candidatus* Nanohalobium constans (the only cultivated representative of the novel genus *Candidatus* Nanohalobium belonging to the novel family Candidatus Nanohalobiaceae of the novel order Candidatus Nanohalobiales of the novel class Candidatus Nanohalobia), which is an obligate ectosymbiont of *Halomicrobum* and is not capable of autonomous growth. Our experiments showed that the host can hydrolyze chitin but does not metabolize either glycogen or starch. The ability of nanohaloarchaeon to hydrolyze these alpha-glucans to glucose ensures the growth of *Halomicrobium* in the absence of a chitin. Thus, it indicates that the nanohaloarchaeon-haloarchaeon association can be both mutualistic and symbiotic, relying on its partner's ability to degrade different polysaccharides, and can be interpreted as a strategy to maximize long-term fitness of the host. Using our experience of successfully cultivating this association, we have recently obtained additional polysaccharide-hydrolysing nanohaloarchaea-haloarchaea co-cultures. In my talk I will demonstrate some initial results of omics analyses, we have performed.

[1] La Cono, V. et al. (2020) Symbiosis between nanohaloarchaeon and haloarchaeon is based on utilization of different polysaccharides. PNAS USA, 117: 20223-20234, DOI 10.1073/pnas.2007232117