Cave vermiculations, life hotspots for studies of hypogean microbiology

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Cave microbiota play a key role in the shaping of underground landscapes. In fact, they are involved in the biogeochemical cycles, interacting with the rock substrates through both constructive and destructive pathways and contributing to the formation of speleothems (1), such as vermiculations, still unexplored peculiar sedimentary structures, occurring on the walls of natural or artificial caves (2). Very recent researches pointed to microbial evidences supporting their biological origin (3-6).
The goal of the work was to shed light on the geochemical and microbiological characteristics of vermiculations from Pertosa-Auletta Cave (Campania, southern Italy), contributing also to the knowledge of microbial biodiversity of this karst system open to tourist visits.
Next-generation sequencing surveys showed the occurrence of Proteobacteria (48.0%), Acidobacteria (11.6%), Actinobacteria (7.1%), Nitrospirae (5.8%), Firmicutes (4.3%), Planctomycetes (3.2%), Chloroflexi (1.9%), Gemmatimonadetes (1.1%). Numerous less-represented bacterial groups (< 1%), Archaea (0.1%), as well as a significant percentage of unclassified microorganisms (13.1%), were also detected (5). X-ray diffraction revealed the mainly calcitic composition of the deposits, with a low amount of quartz and clay minerals. Moreover, they exhibited a wide variation in Al, Ba, Ca, Co, Cr, Cu, Fe, K, Li, Mg, Mn, Mo, Na, Ni, P, S, Si, Sr, Ti, V, and Zn concentrations among the analyzed samples. Field emission scanning electron and confocal laser scanning microscopy supported the hypothesis of the functional microbial activity in the development of vermiculations, highlighting several dissolution shapes, but also the presence of biogenic secondary minerals and organic matter (4).

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References

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