



Assessment of metabolically active bacteria in yellow coralloid speleothems from a pristine lava tube in Canary Islands

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This work is presented as the first multidisciplinary approach on geomicrobiology diversity in lava tubes of Canary Islands (Spain). Abundant yellow coloured mats developing on coralloid speleothems in a lava tube from La Palma Islands were studied by DNA/RNA clone library analyses for investigating both total and metabolically active bacteria along with next-generation sequencing of total DNA. In addition, morphological and mineralogical characterization was performed by field emission scanning electron microscopy (FESEM), micro-computed tomography, X-ray diffraction and infrared spectroscopy to contextualize sequence data. This approach showed that the coralloid speleothems consist of banded siliceous stalactites composed of opal-A and hydrated halloysite. Analytical pyrolysis was also conducted to infer the possible origin of cave wall pigmentation, revealing that lignin degradation compounds can contribute to speleothem colour. Our RNA-based study showed for the first time that members of the phylum Actinobacteria, with 55% of the clones belonging to Euzebyales order, were metabolically active components of yellow mats. It is well known that Actinobacteria play a key role in biogeochemical cycles and biomineralization processes, promoting mineral dissolution or the precipitation of secondary minerals. In contrast, the DNA clone library revealed that around 45% of clones were affiliated to Proteobacteria. NGS techniques reinforced the DNA clone library data at upper taxonomic levels, in which Proteobacteria was the most abundant phylum followed by Actinobacteria.

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