

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 biomimetic 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.

Acknowledgements

This research was supported by the Spanish Ministry of Economy, Industry and Competitiveness (MINEICO), project CGL2013-41674-P. J.L.G-P. and A.Z.M. were supported by a PhD fellowship (BES-2014-069587) and a “Juan de la Cierva – Incorporación” post-doctoral contract (IJCI-2014-20443) from the MINEICO, respectively. The Portuguese Foundation for Science and Technology (Strategic project UID/ECI/04028/2013) are also thanked for financial support. The authors would like to thank the assistance during the field work and photographic contributions in La Palma lava tubes of the speleologist Octavio Fernandez. We gratefully acknowledge the collecting permissions granted by the staff of Caldera del Taburiente National Park (La Palma Island, Spain).