Microbial communities in carbonate precipitates from drip waters in Nerja Cave, Spain

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ABSTRACT

Research on cave microorganisms has mainly focused on the microbial communities thriving on speleothems, rocks and sediments; however, drip water bacteria and calcite precipitation has received less attention. In this study, microbial communities of carbonate precipitates from drip waters in Nerja, a show cave close to the sea in southeastern Spain, were investigated. We observed a pronounced difference in the bacterial composition of the precipitates, depending on the galleries and halls. The most abundant phylum in the precipitates of the halls close to the cave entrance was *Proteobacteria*, due to the low depth of this sector, the direct influence of a garden on the top soil and the infiltration of waters into the cave, as well as the abundance of members of the order *Hyphomicrobiales*, dispersing from plant roots, and other *Betaproteobacteria* and *Gammaproteobacteria*, common soil inhabitants. The influence of marine aerosols explained the presence of *Marinobacter, Idiomarina, Thalassobaculum, Altererythrobacter* and other bacteria due to the short distance from the cave to the sea. Nineteen out of forty six genera identified in the cave have been reported to precipitate carbonate and likely have a role in mineral deposition.

Subjects Microbiology, Molecular Biology, Biogeochemistry
Keywords Nerja Cave, Carbonate precipitate, Drip water, Bacteria

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Additional Information and Declarations can be found on page 16

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INTRODUCTION

In karst systems, meteoric waters percolates through rocks reaching caves where it contributes to the dissolution of carbonate rocks and the formation of speleothems as a result of water degassing and evaporation. Speleothems adopt different forms according to the factors involved in its formation: cave location, water flow, organic matter, microbial communities, *etc*. Although most speleothems were usually made of calcium carbonate (*Fairchild et al., 2007*), siliceous speleothems were reported in volcanic caves (*Miller et al., 2015*) and in both cases were described the contribution of microorganisms to speleothems formation (*De los Ríos et al., 2011*; *Miller et al., 2020a*). *Sauro et al. (2018)* reported that in