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Characterization of carbonate minerals formed by aerobic halophilic bacteria from Lagoa Vermelha, Brazil

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The study of bacterial-mediated mineral precipitation is relevant for a better understanding of the evolution of life on Earth and possibly beyond it, given that the characterization of bioprecipitates can provide evidence about the biogenicity of minerals. This process can occur as abiotic or biotic processes – in which the latter can occur by nucleation of minerals through the extracellular polymeric substance (EPS) of microorganisms[1], [2].

Dolomite is commonly formed at high temperatures in nature, but there is still difficulty in precipitating this mineral at low temperatures (< 50°C). However, Lagoa Vermelha (Brazil) is characterized for its high salinity and alkalinity and can foment current dolomite mineralization through the activity of microbial mats[1].

We isolated aerobic halophilic bacteria from Lagoa Vermelha identified as *Idiomarina* sp., *Chromohalobacter* sp. and *Halomonas* sp. to characterize mineral precipitates and test cell viability in extreme conditions such as UVC radiation and dessication. For mineral precipitation, the bacteria were cultivated in medium containing Ca2+ and Mg2+ and incubated at a temperature of 30°C, for 75 days and pH was measured throughout the experiment. The precipitates were analyzed with Raman Spectroscopy and X-ray Diffraction to identify mineral phases and then compare with SEM/EDS analyses.

In the end of the experiment it was possible to observe shifts in pH from 6.5 to 9, the formation of various phases of Calcium carbonates, such as aragonite and calcite (CaCO3), putative dolomite ($CaMg(CO_3)_2$), and monohydrocalcite ($CaCO_3 \cdot H_2O$). Therefore, we expect to contribute with the establishment of viable protocols for the identification of carbonate mineral biosignatures.

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