

MICROORGANISMS IN DIFFERENT TYPES OF CAVES IN SOUTH AMERICA AND POSSIBLE SURVIVAL STRATEGIES

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Cave systems in South America represent important environments for microbiological, geomicrobiological and astrobiological studies. In this work we discuss the potential studies that can be carried out in different countries that have karstic environments

The continental karst areas represent only a small percentage of the world's total (White et al. 2019); however, the potential they offer for research is immense. Nonetheless, the research that has been carried out shows a rather poor scenario compared to other regions of the world. The study of caves in South America has been quite limited beyond recent advances in some countries, mainly Brazil, Argentina and Venezuela; that limitation is reflected in the limited information available, especially for countries such as Bolivia, Uruguay and Paraguay (Zepon & Bichuette, 2018). The outlook is even bleaker in microbiological aspects, most of the studies focus on the characterization of the associated fauna, and a significant percentage have focused on a single region or system.

Important studies have been carried out on microbiological issues in South America, some of them oriented to the characterization of biodiversity of bacteria, others are related to cave formation processes, and the rest are isolated studies, in which the microbial role in the formation of some characteristic structures in the cave environments has been studied. Studies related to diversity have been carried out in lava tubes found outside the continental shelf (Galápagos Islands); other studies record the diversity of orthoquartzite caves in the Venezuelan tepuis. Only one of these studies approaches the diversity of fungi in a karst system in Brazil. Regarding the microbial role in the cave formation, studies on iron mineral formations in Brazil stand out and the presence of groups of bacteria capable of reducing iron compounds and thus contributing to the cave forma-

tion is reported. Regarding speleothems in sandstone caves, it was determined in a cave from Venezuela that all the types studied present a similar genesis with a common mineralogical composition despite morphological differences, and they present evidence of microbial origin (Aubrecht et al. 2008).

The diversity found in studies carried out in cave systems in South America shows similarity to that reported in studies around the world. For bacteria it is found that the dominant Phylum corresponds to Proteobacteria, Actinobacteria and Acidobacteria mainly, however, there is a variation in the composition of dominant communities. This variation is correlated with physical, chemical factors even up geographical location as has been pointed out in some studies; This has contributed to the discussion on Microbial Biogeography (Hathaway et al. 2014). Taking into account the particular conditions that South America offers, it is important to advance in geomicrobiological studies and determine if there are particular distribution patterns of microbial communities, under conditions that may favor the development of new survival strategies or the prevalence of different ones from those observed in temperate regions.

REFERENCES

- Aubrecht, R., Brewer, C., Branislav, K., Vlcek, L., Lanczos, L. et al. 2008, 16th Intern. Karstol. School “Classical Karst”, Karst Sediments, Postojna, Proceedings, 2008, 1
- Hathaway, J. J., Garcia, M. G., Balasch, M. M., Spilde, M. N., Stone, F. D., Dapkevicius, M. D., Amorim, I. R., Gabriel, R., Borges, P. A., Northup, D. E. et al. 2014, *Geomicrobiol. J.*, 31(3), 205
- White, W. B., Culver, D., & Pipan, T. 2019, *Encyclopedia of Caves* 53 (9)
- Zepon, T., & Bichuette, M. E. 2018, *Conference Abstracts (ARPHA)*, 1

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