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EVALUATION OF EXTRATERRESTRIAL LIFE ORIGIN BASED ON EXTREME ENVIRONMENTS EVIDENCE

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INTRODUCTION
Life arose on Earth between 4.6 and 3.5 billion years ago (old fossil record)\(^1\), when the planet displayed massive, tempered (-2-50ºC) water bodies, with pH values relatively neutral (6-7), as well as mainland territory (60ºC)\(^2\). Several celestial bodies show similar characteristics, however, Mars accessibility encourages research to focus on its study. Since 1960, different space agencies have devoted missions to investigate Mars' conditions and potential habitability. These missions concluded that, in the past, 20% of the Red Planet was covered in water, essential for life to originate, at a life-permissive temperature\(^3\). Upcoming missions are aimed to evaluate the presence of biosignatures that reveal ancient biological activity. The study of extreme environments on Earth allows international agencies to choose an adequate location for current (e.g., Perseverance Rover) and future (e.g., Rosalind Rover) missions in their endeavour to find life on Mars.

ACIDIC IRON-RICH WATER BODIES

Hematite (Fe\(_2\)O\(_3\)) formations in the Rio Tinto Basin preserve fossilized textures that indicate the presence of past organisms that enabled the deposition in the first place (Figure 3). Hematite deposits in Mars (Figure 2) seem to have been formed similarly to those on Earth, suggesting a shared biogenic origin and an akin form of indirect preservation.

SUBSURFACE

Biological alteration produces conspicuous micron-scale granular and tubular textures in basaltic materials (Figure 6), such as those found in Mars' subsurface\(^4\).

FUMAROLIC ENVIRONMENTS

Microorganisms isolated from Earth's environments play an important role in soil's biogenesis, suggesting a potential biological origin for Martian opal formations\(^5\).

MATERIAL & METHODS

Resources: NASA, ESA, CAB, LCOGT, Space.com, Marspedia.org

Search engines: NCBI, PubMed, GoogleScholar

Keywords: Mars, Earth, Biosignature, Extremophiles, Analogue

OBJECTIVES

1) To assess the possibility of extraterrestrial life existence from the study of terrestrial analogue environments.

2) To evaluate how the finding of life would illuminate the question about its origin on Earth.

CONCLUSION

There might not be living organisms on Mars currently, however, their past existence might have left some detectable hints, changing our perspective on the origin of life concerning its probability. Even if nothing is found, Mars would be the perfect model to understand why life hadn’t appeared despite conditions being favorable.