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UNDERSTAND THE ORIGIN AND EVOLUTION OF LIFE ON MARS VIA EXTREMOPHILES

Abstract

Prokaryotic life has dominated most of our planet's evolutionary history, developing to fill nearly every accessible environmental niche. Extremophiles, particularly those who thrive in multiple extremes, are a major subject of study for a variety of fields, ranging from the study of adaptations to severe environments to the biogeochemical cycling of elements. Extremophile research has ramifications for studies of the genesis of life as well as the quest for life on other planets and celestial bodies. The parameters under which life can survive have been pushed in every direction during the last century, including greater expanses of temperature, pH, pressure, radiation, salinity, energy, and nutrient restriction. Microorganisms can live in a wide range of environments on Earth, but they can also withstand the severe conditions of space, which include strong radiation, vacuum pressure, highly fluctuating temperature, and microgravity. Other planetary bodies' surfaces are often exceedingly cold, in addition to radiation. The temperature of Venus, for example, ranges from -138C (Mars) to -233C (Enceladus), with a maximum projected temperature of -179C (Titan) to 30C (Mars). According to this, the average temperature of prospective Earth analogue satellites is substantially less than -5C, with many satellites likely experiencing huge temperature variations. This suggests that knowing the physiology of radiation-tolerant psychrophiles, such as the development of a fibril network, cell aggregation, and cold shock proteins, is vital for understanding the potential of life on the surface of other planetary bodies. The focus of the research are Psychrophiles such as Planococcus halocryophilus OR1, Aeromonas, Acinetobacter, Alcaligenes, Psychrobacter, Brochothrix, Enterobacter, Microbacterium, Moraxella, and Carnobacterium. To better understand life on Mars, we will research these bacteria using lab-simulated planetary circumstances and look at the alterations in genetic level that occur in bacterial life in a martian environment. To complement these talks, this study will examine the factors that restrict life, defining the ranges within which life has been identified (hence referred to as "border conditions") and identifying knowledge gaps and opportunities.