Survival and adaptation of haloarchaea in extreme environment: Implications in Astrobiology

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Outer space, Planets and satellites excluding earth has an environment that is characterized by harsh inhabitable zones. The steep fluctuations in temperature, atmosphere, oxygen, radiations, salinity, perchlorate, epsomite, gravity and numerous other factors are responsible for hostile and intolerable conditions for growth of life. For addressing issues related to astrobiology, quest of life in outer space and search for habitable zones for sustenance of life beyond earth; the presponse of organisms in hypergravity, microgravity,salinity,dessication and radiation poses to be an important requisite. As halophiles are considered models to study Astrobiology[1], we invetigated the response of extreme Haloarchaea to altered gravity, salinity and dessication to study the possible effect and adaptability of life forms in outer space. In the present investigation, we have explored the response of extreme haloarchaea previously isolated from Indian salterns [2]. The extreme haloarchaea *Haloarcula argentinensis* RR10 and *Natronococcus jeotgali* RR17 were exposed to multiple stress and their growth, physiology, adaptation and antibiotic resistance pattern was studied. Both the haloarchaeae demonstrated growth in the presence of hypergravity upto 293 X*g* [3]. However when exposed to gravity values from > 505 × *g*, the growth was retarded. Exposure to hypergravity and microgravity changed the antibiotic resistance pattern of the archaea[4]. The morphology of these organisms was altered and they enhance and overproduce the protective pigment bacterioruberin. Besides they effectively, upregulated the production of small proteins probably responsible for balancing effects of stress and maintenance of protein homeostasis. Alteration of antibiotic resistance of haloarchaea in stress revelas the importance of studying the virulence of organisms in outer space and space flights [5,6]. The survival of these Haloarchaea in such simulated microgravity, hypergravity or high concentrations of perchlorate, halite, lithium chloride, temperature and epsomite make an interesting possibility of the plausible survival of Haloarchaea type life forms in outer space and if not, it highlights the potential adaptability of these Haloarchaea to Martian conditions or unhabitable zones in outer space if explored. Nevertheless, the detection and habitability of microbial life in extraterrestrial environment may no longer be restricted as extreme haloarchaea have demonstrated survival and adaptation in extreme environment.

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