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”Life in space project: Fungal growth ability and ultrastructural damage after growth in hypersaline substrata”

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Over the years, the presence of perchlorate salts has been detected on the Martian surface. Perchlorates may have been formed by ultraviolet activity on chlorine compounds left behind, for example, by ancient seas or lakes. These salts are derived from the union of a chemical element (Na, Ca, Mg and K) to a group of atoms consisting of 4 oxygen atoms bonded to a chlorine atom. Notably, the presence of these compounds may contribute to the formation of stable brines on the Martian surface, where liquid water may be stored. From an astrobiological point of view, the possible occurrence of salt water on the planet may increase the likelihood to find hypothetical Martian microorganisms. However, high concentrations of perchlorates are toxic for most of known organisms. Despite that, some microorganisms, thanks to their adaptation to harsh environmental conditions, may exhibit extraordinary resistance to the extreme factors described on Mars, such as high perchlorate concentrations. In this regard, the Life in space project has been established with the aim of evaluating the responses of several selected microorganisms to the exposure to relevant space conditions, among which the presence of perchlorates. In the present work, which is part of the Life in space project, the survival of the Antarctic cryptoendolythic black fungus Cryomyces antarcticus on growth media containing perchlorate salts was evaluated. Our results show an extraordinary resistance of the micro-organism in terms of maintaining growth capacity and structural integrity up to the highest concentrations, thus extending the limits of fungal resistance to the presence of perchlorate salts. Furthermore, this work gives new insights into the possibility of finding terrestrial-type life forms on Mars.

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