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SALT-LOVING MICROBES, LIMITS OF LIFE, MARS AND THE MESSINIAN SALINITY CRISIS

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Hypersaline environments are subjected to dynamic environmental conditions which can result in precipitation of salt crystals, including halite. Microbial communities living in salt-saturated environments get trapped inside halite, including members of the three domains of life, but primarily haloarchaea. Entombment is a strategy for avoiding the harsh bittern brine that remains after halite precipitation. There is strong evidence that haloarchaea can survive in halite over geological time, which has remarkable implications about the limits of life and the possibility of life on Mars, where salt crystals are found. However, potential life on Mars would have to cope with high levels of solar and cosmic radiation. We asked whether co-entombment of *Halobacterium* spp. with the halophilic microalga. *Dunaliella salina,* enhances survival, e.g. by sharing nutrients. Surprisingly, *D. salina* did not enhance survival of *Halobacterium* spp., but its presence allowed *D. salina* to survive entombment for longer, at least over a short period of time. We also tested the capacity of *Halobacterium* spp. and the halophilic bacterial species *Salinibacter ruber* to tolerate UV and ionising radiation when in halite crystals. All species survived UV irradiation when in halite crystals and *Halobacterium* even survived a ionising radiation dose of 5 kGy. The longevity of haloarchaea, together with their tolerance to radiation, makes them a good model to investigate putative signs of past life in the Messinian, as well as past or present life on Mars, and potentially other celestial bodies.