LIFE TRAPPED IN ICE: MICROBIAL SURVIVAL AND ACTIVITY WITHIN MELTED BRINES IN LAYERED ICES RELEVANT TO MARS

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Abstract: Mars is a prime candidate for supporting living systems. Since liquid water is rare, Martian life might exist inside brine near the surface trapped between layers of pure water ice from frost and aeolian regolith deposits. Our lab examines whether salinotolerant bacteria including Marinococcus sp. str. HL11, Halomonas sp. str. BLE7, and Halomonas sp. str. GSP3 can survive and metabolize under artificial Martian conditions. The configuration that might best mimic natural Mars ices is ice lenses where pockets of bacterial cultures are entirely surrounded by pure water ice. We hope liquid culture encased in ice will prevent edge effects from containers. The ice lenses are created by freezing a layer of pure water with a central depression. Salty bacterial cultures are frozen in this well and pure water is frozen as a top layer. The salty culture melts at a lower temperature than the surrounding ice, so experiments can be performed with liquid culture encased in ice. A culture lens at 15% NaCl will melt at -12 Â°C, while the water ice layers remain frozen. We are working to understand how cells respond to entrapment inside the brine lens, including performing assays with XTT to study respiration and measuring survival rates with dilution plating. We believe that cells settle inside the lens and create a biofilm. This project will inform the search for life on Mars by identifying suitable habitats to target and contribute to planetary protection protocols by characterizing the limits of life. Funded by NASA and FYRE.

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