

# Polar Microbes Give Peptide Clues For Detecting Life on Icy Worlds

**Introduction:** Some of the moons around the gas giant planets likely have subsurface liquid oceans deep beneath their icy crusts that could host living organisms. This new study, from a cross-departmental group at University of Washington, explored conditions affecting the growth and long-term viability of a well-known and characterized model psychrophile, and searched for statistically enriched biomolecules that could serve as condition-specific biomarkers of life.

*If life is present in subsurface oceans on icy worlds, can we use these cold adapted organisms on Earth to understand what to look for in our search for life in such places?*



**Experiments & Results:** A model marine psychrophile, *Colwellia psychrerythraea* 34H, was grown for 4 months in 8 different sets of salinity and nutrient conditions and in two subzero environments. Analysis of the proteins produced under these conditions suggests that the organisms utilize unique ways to process energy from the environment in order to survive under these harsh conditions. About 20 short protein fragments were identified as being useful for identifying organisms in similar environments.

**Significance:** This study provides insight into how psychrophiles respond to specific constraints of low temperature and/or high salinity environments on Earth and thus possibly in subzero environments of other bodies in our solar system. Additionally, short peptide biomarkers for cold, active life in highly saline environments have been detected on commercial mass spectrometers, and are being explored with spaceflight instrumentation led by Ricardo Arevalo Jr. at the University of Maryland College Park.

← Deciphering the limits of life on Earth also provides us with a list of biomolecules that are enriched and detectable using mass spectrometers. Knowledge of what molecules can be found in these unique environments allows us to target them on off-planet explorations using similar instrumentation.-  
Brook L. Nunn

Mudge, Miranda C., Brook L. Nunn, Erin Firth, Marcela Ewert, Kianna Hales, William E. Fondrie, William S. Noble, Jonathan Toner, Bonnie Light, and Karen Junge. "Subzero, saline incubations of *Colwellia psychrerythraea* reveal strategies and biomarkers for sustained life in extreme icy environments." *Environmental Microbiology* (2021).

Slide adapted by E. Firth, created by B. Nunn

