Bubbles are rockets for microbes; predicting microbial dispersion in Enceladus's plumes based on bubbling in Iceland's geothermal springs.

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The Cassini Mission confirmed Enceladus, a moon of Saturn, has a sub-surface ocean that is hydrothermally active and contains the ingredients for life[1]. The moon also produces supersonic plumes that eject aerosolised droplets of ocean water into space, likely formed by vigorous bubbling of hydrothermal gases[2]. Dependent on these bubbling mechanics, if life is present in the ocean, long distance microbial dispersion may occur via the plumes allowing for sample by spacecraft[3,4]. Despite this theory, it is unknown what evidence of microbial life might be transferred into the plumes by this bubbling. This presentation discusses preliminary results of a field campaign that used Iceland's geothermal springs as analogue sites for Enceladus plume formation. Iceland was selected as its geothermal springs and Enceladus's ocean share aerosolisation driven by bubbling of hydrothermal gases and both host niches for chemotrophic microbial communities[5,6]. *In situ* sampling and aerosol monitoring was undertaken at Ölkelduháls, within the Hengill volcanic massif, at bubbling hot springs of varying temperatures (65ºC – 86ºC), pH (2.5 – 6.5) and size. Total aerosol particle count decreased with downwind distance from the springs. Despite this, particle size distribution was dominated by larger particles (≤ 10 µm in diameter) at all distances from the aerosol source. This observation is likely due to present bubbling mechanisms, as background samples contained proportionally fewer particles ≤ 10 µm in diameter. Future analysis will quantify aerosol microbial abundance and size distributions using Flow Cytometry. Microbial community structure in the aerosol will also be investigated using DNA sequence analysis techniques. Combined, these analyses will provide detailed information regarding whether the captured aerosol microbes represent the entire spring's community, or just a snapshot. Overall, this work can make predictions about microbial dispersion dynamics in the plumes of Enceladus if life is present on the icy moon. This work may help inform future missions that seek evidence of life by capturing plume material.

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