**Microbial sulfur oxidation under high pressure conditions: A whiff of O2**

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Elemental sulfur (S0) is a key intermediate species for biochemical sulfur cycling in hydrothermal deposits and plumes at mid-ocean ridges. However, the bioavailability and microbial utilization of S0 at conditions relevant to deep-sea hydrothermal environments are poorly known. As a result, there is a discrepancy between predictions based on energetics and the observed physiology of S-oxidizing microorganisms that have been isolated and grown in laboratory conditions. To address this knowledge gap, we studied how a hydrothermal strain of the S-oxidizing bacterium Thiomicrospira thermophila responds to pressure and substrate variations by conducting high-pressure continuous culturing experiments at seafloor pressures (100 bar). We found that this strain mediates several different oxidation reactions of S0 and/or S2O32- simultaneously. When O2 is available in excess, the type of sulfur reaction mediated changes rapidly (<1 hour) to maintain growth rates and the combination of biochemical processes mediated tend to be those that produce the most energy given the availability of substrates needed. However, when O2 becomes limiting, then reactions requiring high O2 consumption (such as S0 oxidation) are inhibited and growth can no longer be sustained. Thus, the adaptability of this strain to grow at high-pressure conditions is linked to the availability of dissolved O2. This suggests that in regions where dissolved O2 concentrations are relatively high, such as in shallow marine sediments along continental margins, these types of S-oxidizing bacteria could represent a significant portion of the total microbial biomass. However, in the S-rich but O2-depleted deep sea hydrothermal vents, the relative proportion of biomass and geochemical impact might be less than expected.