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Iron oxidation by *Hydrogenovibrio* isolated from deep sea hydrothermal vents

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Hydrothermal vent systems are hot spots of life on the seafloor. Here, hot, hydrothermal fluids ascend from inner Earth and admix with cold, oxygenated seawater on their way to the surface. Thereby they form thermal and chemical gradients. The created chemical disequilibria can be exploited by chemosynthetic microbes to gain energy e.g. for CO_2 fixation. Hydrothermal fluids are enriched with e.g., reduced sulfur compounds, hydrogen, ferrous iron. Once the hydrothermal activity ceases, the precipitated mineral structures continue to react with seawater and mark a source for chemosynthetic microbes.

Members of the *Hydrogenovibrio* species are common and sometimes quite abundant in hydrothermal vent habitats. We have found them associated with inactive chimneys along the Indian ridge, where chalcopyrite ($CuFeS_2$) was particularly abundant [1]. Here between 15% and 25% of the Bacteria were related to *Hydrogenovibrio*. Correlation analyses suggested the sulfur content in the minerals as the prime determinant for their presence. These *Hydrogenovibrio* were previously classified as *Thiomicrospira*, which were initially described as chemolithotrophic sulfur-oxidizers capable of using hydrogen sulfide, thiosulfate, tetrathionate and sulfur under aerobic and/or microaerobic conditions. In the last years it has been demonstrated that besides reduced sulfur compounds, some of these Bacteria can also utilize hydrogen [2] and iron(II) [3] as alternative electron donors. Iron supplemented incubation experiments using hydrothermal emissions further underlined their ability to consume iron(II) fueling CO_2 fixation [4]. In these experiments their abundance increased from 15% in the naturally occurring fluids to 53% in our iron-spiked incubations.

We here present a new autotrophic, microaerophilic iron(II)-oxidizing *Hydrogenovibrio* species and monitor its iron(II) consumption and respective iron(III) mineral formation. We further describe its distribution in the hydrothermal settings from which it was isolated and discuss its role for biotransformation and biogeochemical cycling.

[1] Han, Gonnella, Adam, Schippers, Kurtz, Schwarz-Schampera, Franke & Perner (2018), *Scientific Reports* 8, 10386

[2] Hansen & Perner (2015), *ISME Journal* 9,696-707

[3] Barco, Hoffman, Ramirez, Toner, Edwards & Sylvan (2017), *Environmental Microbiology*, 19, 1322-1337

[4] Böhnke, Sass, Gonnella, Diehl, Kleint, Bach, Zitoun, Koschinsky, Indenbirken, Sander, Kurtz & Perner (2019), *Frontiers in Microbiology*, https://doi.org/10.3389/fmicb.2019.02296