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Biotic and abiotic controls on iron oxide deposition in the gill chamber of the symbiotic vent shrimp *Rimicaris exoculata*.

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It was suggested that the hydrothermal vent shrimp *Rimicaris exoculata* may derive its nutritional needs from chemoautotrophic microbes colonizing its branchial cavity. A unique feature of the shrimp from the Rainbow vent field (Mid-Atlantic Ridge) is the association of this microbial epiflora with abundant iron oxides. These oxides accumulate throughout the moulting cycle, and their distribution has led to the assumption that iron oxidizers may develop in the gill cavity. Geochemical modelling confirmed that iron oxidation constitutes one of the main energy sources for the epibionts, resulting from the particular enrichment in dissolved ferrous iron and the respective depletion of other electron donors the shrimp environment at this site.

Iron oxidising bacteria develop in very specific microenvironments where they are able to compete with the abiotic oxidation of Fe(II) by oxygen. In this study we have assessed the kinetic constraints governing iron oxidation in the environmental conditions of the shrimp swarms. Two abiotic oxidation mechanisms were considered: the formation of ferric iron oxides from dissolved Fe(II) (homogenous oxidation), the oxidation

catalysed by adsorption of Fe(II) on ferric hydroxide (heterogeneous oxidation). The heterogeneous oxidation rate was quantified for various amounts of iron hydroxides, reflecting its progressive accumulation over time during the shrimps' moulting cycle. The substantial catalytic effect that was evidenced suggests that the abiotic oxidation may strongly compete with microbial use of iron after first moulting stages with low oxide abundance. This could partly explain the encrustment of microbes in a dense mineral layer that was described just prior to moulting.