

Interactive comment on “Iron encrustations on filamentous algae colonized by *Gallionella*-related bacteria in a metal-polluted freshwater stream” by J. F. Mori et al.

D. Emerson (Referee)

demerson@bigelow.org

Received and published: 18 June 2015

This paper presents a somewhat surprising finding, the occurrence of neutrophilic iron-oxidizing bacteria associated with algal filaments in a stream with very high iron concentrations. This is surprising because we normally think of these bacteria as being adapted for microaerophilic conditions, and unable to compete with the abiotic oxidation of iron under the fully saturated O₂ conditions that occur in association with photosynthetic algae. The authors do a convincing job of showing the presence of these bacteria. It is possible to argue these findings are circumstantial, because they do not show the bacteria actually live by iron-oxidation; however this group has pretty

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

much only been found in high iron environments with all cultured representatives able to grow on iron, and, as yet, there are no definitive functional assays for iron oxidation so they have done a nice job based on current knowledge.

The authors could do a better job of placing this work in context and emphasizing some of the more important and surprising aspects of the work, i.e. that it goes against current dogma of these bacteria being strict microaerophiles, and I would argue some of these concepts are more important than ones that have been addressed in introduction and discussion.

They do not mention if characteristic structures of FeOB were observed, these are a typical diagnostic for FeOB; however not all FeOB produce them, so it is interesting if they were not observed.

There was no observation of diurnal cycles, is it possible that at night the O₂ levels go to a much lower level allowing an opportunity for FeOB to grow under low O₂?

Specific comments. Abstract, could be better written, and it is not proven that high iron kills these algae, at best evidence is circumstantial; therefore would not conclude this.

p4, l15 Better not to suggest specific O₂ saturations, since these are not well quantified.

p4 l23, This is speculation and has not been proven, best to not mention.

p4-5, Don't follow the significance of mentioning EPS here, presumably algal production of EPS will dwarf production by bacteria, besides much of this discussion deals with acidic systems, yet the significance of the work is really related to more circum-neutral systems.

P5, Introduction would be better to mention other work done related to iron-oxidation and algae, specifically discuss Chocolate pots in Yellowstone and work of Kapplers group on spring in Switzerland with cyanobacteria and iron oxidizers. CP work suggests there should be co-existence of photosynthetic algae and FeOB.

[Full Screen / Esc](#)[Printer-friendly Version](#)[Interactive Discussion](#)[Discussion Paper](#)

Interactive
Comment

p7 I18 Should give the specific glycoconjugate this lectin binds to.

p11 I3 The increase in O₂ was presumably a result of algal photosynthesis, while the increase in pH likely resulted from a combination of CO₂ outgassing, and draw down of CO₂ via algal growth.

p16 I24 I would not say the stalks are composed of polysaccharides, should cite work of Chan and Japanese workers who have explicitly looked a stalk composition, not Hanert.

p11 I7 Need to explain what expected temps would be without exothermic input.

p11 I15 Why? You state below you could reach it in August.

p15 I12 This doesn't make a whole lot of sense, FeOB normally need very little O₂, the algae to supersaturating O₂.

p15 I20 Could the iron coatings being acting as buffers that help prevent the plant from taking up metals, this as been suggested as a type of protection for root plaque

p16 I5 What about relative abundances of heavy metals, Gall may be more resistant, Sideroxydans less so. See recent Frontiers paper on this.

p17, I25 Still need a better discussion of how FeOB deal with the high oxygen. Especially in terms of Fenton chemistry. Also should cite work of de Vet who showed that Gallionella in water treatment systems was growing at surprisingly high O₂ concentrations.

p18 I5 Some confusion here, are the green algae a separate genus or species from the yellow-green algae?

p18 I 13 I would say detrimental not fatal, since for most the of the season the algae appeared to grow.

Interactive comment on Biogeosciences Discuss., 12, 7705, 2015.

[Full Screen / Esc](#)[Printer-friendly Version](#)[Interactive Discussion](#)[Discussion Paper](#)