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Biogeosciences Discussions

Interactive comment on "Ferrihydrite associated organic matter (OM) stimulates reduction by *Shewanella oneidensis* MR-1 and a complex microbial consortia" *by* Rebecca E. Cooper et al.

S. Hayes (Referee)

shayes@usgs.gov

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Review of: Cooper et al., 2017

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Reviewer: Sarah Hayes

Recommendation: Minor Revisions

Summary: Cooper et al. is a thoughtfully designed and compares the rate of microbial iron reduction by Shewanella oneidensis MR-1 and a natural microbial isolate from an Fe-rich fen as a function of organic matter concentration and association with ferrihu-

drite (sorbed vs coprecipitated). The nature of mineral-organic matter interactions in the natural environment is an active area of research and the influence of nanoscale mineral and organic matter associations on microbial behavior is very timely, interesting, and well-suited for publications in Biogeosciences. The study is very clearly outlined and easy to understand with surprisingly similar rates of Fe reduction by the Shewanella oneidensis MR-1 and a fen microbial isolate. The manuscript is clearly written with a few typos that do not distract from the meaning.

General comments:

Overall, this is a lovely manuscript. The discussion section could use a little bit of streamlining to really highlight the important contributions a bit better.

- It seems like the bulk of the section 4.0 could be redistributed into the other sections of the paper

- Section 4.3 could probably be absorbed by the results section. And any mention in the discussion might be best integrated into another section.

- The conclusions section could also be streamlined to quickly revisit the key findings of the study.

Specific comments:

L11: should be "this study investigated to what extent"

L14: should be "OM content" not "contents"

L48: should be "coprecipitation is the more common process"

L49-51: This sentence isn't super clear. Consider breaking it into two sentences or maybe just clarifying the end, something like "reducing agents potentially differ between ferrihydrite precipitated in the presence of OM and purely adsorbed OM.

L61: Again, this sentence isn't quite right. Consider something like: "dissolved humic

acid and the mineral/humic acid ratios have been shown by some studies to increase Fe (III) reduction rates (ref) while other studies have not reproduced this result (ref)." But I'm not sure it keeps the meaning of what you are trying to communicate.

L85: Consider revising to: "Further, this study found that reduction rates by Shewanella were correlated. . ."

L86-97: This section could flow a bit better. All the pieces are there, but it feels disjointed.

L94-97: This is an excellent way to close this paragraph!

L105-7: I think this surprising result (which is way cool!) should be moved to later in the paper, maybe the results section. It doesn't really fit here in the introduction.

L136: Add the information about the organic matter here (from lines L146-147 and from the discussion L379-82). Then maybe make the rest of the paragraph here with the information about the soil organic matter extraction first and then

L152: Should be "These cultures were. . ."

L326: Add mineral formulas to the list of minerals observed.

L331-4: This sentence is a little difficult to understand, please reword to improve clarity.

L352: I'm not sure of your exact meaning, please consider revising to something similar to these suggestions, depending on your meaning: "amendment with each of these substrates stimulates Fe(III) reduction. . ." or "amendment with all of these substrates stimulates Fe(III) reduction. . ."

L356: Consider "the substrate mixture used in these ferrihydrite. . ."

L329-345: Would some or all of this material be better suited for introductory material? If not, try to make a stronger discussion point.

L358-365: It seems like there is a topic change here that feels disjointed. The summary

comments beginning on L 360 seem like they should precede the content earlier in the paragraph and are important to discuss in their own right.

L367: Consider: "OM stimulates growth and Fe(III) reduction by S. oneidensis MR-1 and the microbial consortia."

L373-4: Consider revising: "reducing conditions, which showed that S. putrefaciens was capable of using humic acids as an electron shuttle to enhance Fe(III) reduction. However, enhanced Fe reduction was only observed when the concentration of organic. . ."

L377: Consider revising: "which has lower aromatic moieties, and. . .

L378: Consider revising: "electron shuttling capacity to. . ."

L379-82: I think the info about the organic matter seems like it should be in the methods section.

L383-386: seems like these details should also be in the methods, although they are also important here.

L394: The colon should probably be a period.

L397: The comma between "directly" and "because" does not seem necessary.

L405: Consider revising: "oxide surfaces: via direct contact. . ."

L406: The "or" should be an "and"

L428: Consider revising "Fe(III) oxides. However, . . ."

L429: "abundant" should be "abundance"

L433: "inked" should be "linked"

L441: Should be "the question of whether"

L441: consider revising: "bacteria remains unanswered."

L442: the citation at the end of the sentence is redundant of in text citation.

L474: Should be “formation from pure. . .”

L480-482: This is kinda new information, which should be mentioned earlier (maybe with the other content in section 4.3). Further, you need a citation because this study does not provide any direct evidence to support this claim (which is likely the case).

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