Peer Community In
Ecotoxicology & Environmental Chemistry

New insights into eDNA sorption onto environmental carbonaceous materials

Pierre Labadie *based on reviews by Jérôme Duval and 1 anonymous reviewer*

A recommendation of:

Soot and charcoal as reservoirs of extracellular DNA

Stanislav Jelavic, Lisbeth Garbrecht Thygesen, Valerie Magnin, Nathaniel Findling, Sascha Müller, Viktoriia Meklesh, Karina Krarup Sand *ChemRxiv, ver. 5 peer-reviewed and recommended by Peer Community in Ecotoxicology and Environmental Chemistry*
https://doi.org/10.26434/chemrxiv-2021-9pz8c-v5

Open Access

Data used for results

- ***https://doi.org/10.5281/zenodo.6458203***

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Recommendation

In recent years, the use of environmental DNA (eDNA) to investigate biodiversity has gained considerable interest (Thomsen and Willerslev, 2015; Mauvisseau et al., 2022). It allows for the indirect detection of species but it requires a sound understanding of eDNA behaviour and persistence in the environment. This is, however, a complex task because eDNA may be found in several states (e.g., dissolved, adsorbed, intracellular or intraorganellar), which display specific decay rates controlled by environmental factors (Harrisson et al., 2019; Mauvisseau et al. 2022). In the environment, dissolved DNA may interact with the surfaces of various sorbents, including mineral and organic particles/colloids. Current knowledge on eDNA sorption suggests that eDNA–sorbent interactions are controlled by electrostatics as well as inner-sphere complex formation (Mauvisseau et al., 2022).

In this context, the work undertaken by Jelavic et al. (2022), focused on the adsorption of eDNA by lesser-investigated carbonaceous materials (CMs), namely soot and charcoal, as common non-mineral environmental surfaces.

The authors aimed to study the adsorption capacity of soot and charcoal surfaces with respect to eDNA, in relation to solution parameters (i.e., pH, ionic strength, concentration/type of cations), time and eDNA length, under both non-equilibrium and equilibrium conditions. Using such an approach, Jelavic et al. demonstrated the large adsorption capacities of CMs and the strong binding of DNA to these sorbents. The authors did not provide definitive conclusions on the mechanisms of eDNA sorption onto CMs. However, they provided new elements suggesting that, along with electrostatic

interactions, hydrophobic interactions might play an important role in the adsorption of eDNA to CMs such as soot and charcoal.

Altogether, the results presented in this paper highlight the relevance of CMs as sources of biodiversity information. In addition, it is likely that those results will also prove useful for the community to improve protocols for eDNA extraction from environmental samples that contain high fractions of CMs, e.g. urban soils.

References

Harrison JB, Sunday JM, Rogers SM (2019) Predicting the fate of eDNA in the environment and implications for studying biodiversity. Proceedings of the Royal Society B: Biological Sciences, 286, 20191409. https://doi.org/10.1098/rspb.2019.1409

Jelavic S, Thygesen LG, Magnin V, Findling N, Müller S, Meklesh V, Sand KK (2022) Soot and charcoal as reservoirs of extracellular DNA. ChemRxiv, ver. 5 peer-reviewed and recommended by Peer Community in Ecotoxicology and Environmental Chemistry. https://doi.org/10.26434/chemrxiv-2021-9pz8c-v5

Mauvisseau Q, Harper LR, Sander M, Hanner RH, Kleyer H, Deiner K (2022) The Multiple States of Environmental DNA and What Is Known about Their Persistence in Aquatic Environments. Environmental Science & Technology, 56, 5322–5333. https://doi.org/10.1021/acs.est.1c07638

Thomsen PF, Willerslev E (2015) Environmental DNA – An emerging tool in conservation for monitoring past and present biodiversity. Biological Conservation, 183, 4–18. https://doi.org/10.1016/j.biocon.2014.11.019

Conflict of interest:
The recommender in charge of the evaluation of the article and the reviewers declared that they have no conflict of interest (as defined in the code of conduct of PCI) with the authors or with the content of the article.

Reviews

Toggle reviews

Reviewed by Jérôme Duval, 24 Oct 2022

The authors have answered all comments arisen by the referees. Even though i think that authors should have written parts of their manuscript with more nuance than they do (especially the parts related to modeling aspects and to ensuing conclusions on adsorption mechanisms, see comments by referee 1) and that they should have added the references mentioned by the referees so as to indicate refined ways of addressing physicochemical properites of their sorbing substrate, it is my opinion that the revised version of the manuscript can now be accepted for publication.

Reviewed by anonymous reviewer, 04 Nov 2022

The revised version provided by the authors and their detailed answers to my comments significantly enhance the quality of the paper. I am still not fully convinced by all the aspects tackled in this manuscript but I think that this piece of work can be useful for the community and I then am willing to accept the revised version of this manuscript.

Evaluation round #1

DOI or URL of the preprint: *https://chemrxiv.org/engage/chemrxiv/article-details/6252a626742e9f5170593352*

Version of the preprint: 3

Author's Reply, 10 Oct 2022

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Decision by Pierre Labadie, posted 30 May 2022

Dear authors,
Please find attached the two reviews that we have managed to obtain for your manuscript. As you will see, the two reviewers raised a number of major issues regarding this manuscript. If you feel that you can respond to these comments, please provide us with a revised version together with a point-by-point answer to reviewers' comments. Please outline every change made in response to their comments and provide suitable rebuttals for any comments not addressed. Please note that your revised submission will be re-reviewed.
Best regards,
Pierre Labadie

Reviewed by anonymous reviewer, 10 May 2022

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Reviewed by Jérôme Duval, 17 May 2022

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