Comment on "A Pilot-Scale Field Study: *In Situ* Treatment of PCB-Impacted Sediments with Bioamended Activated Carbon"

Tao Lyu[†‡], Robert Mortimer[†‡], Gang Pan*[†‡]

[†]*School of Animal, Rural and Environmental Sciences, Nottingham Trent University, Nottinghamshire NG25 0QF, UK*

[‡]*Centre of Integrated Water-Energy-Food studies (iWEF), Nottingham Trent University, Brackenhurst Campus NG25 0QF, UK*

**e-mail: gang.pan@ntu.ac.uk*

Rayne *et al*[1] evaluated, by the means of an *in-situ* pilot scale experiment, a combined approach involving microbial bioaugmentation and enhanced sorption for polychlorinated biphenyls (PCBs) remediation in the sediment. The activated carbon (AC) was amended with 1) the anaerobic organohalide respiring bacterium (DF1) and 2) the aerobic PCB oxidizing bacterium (LB400). The paper pointed that the AC can successfully deliver both bacterial onto sediment as carrier with minimized toxic effect to the indigenous microbial populations. PCBs can be effectively removed through anaerobic dechlorinating, where AC (contained cellulose) act as electron donor for PCBs, and followed aerobic oxidizing of dechlorinated PCBs. The authors concluded that "*In situ treatment of PCBs using an AC agglomerate as a delivery system for bioamendments is particularly well-suited for environmentally sensitive sites where there is a need to reduce exposure of the aquatic food web to sediment-bound PCBs with minimal disruption to the environment*".

However, we claim that the conclusion is overestimated due to the lack of knowledge of sediment characteristics. For example, sulfate (SO_4^{2-}) concentration has increased in freshwater environments throughout the world due to anthropogenic activities, where majority of the SO_4^{2-} has been accumulated in the sediment[2]. In the sediment with high SO_4^{2-} concentrations, SO_4^{2-} is theoretically priory to accept electrons compare with PCBs during reduction reaction due to the higher standard redox potential property. Thus, to apply the proposed approach in the published paper may result higher sulfide production but not the dechlorinating reaction, which may significantly change the pollutants biogeochemical cycle in sediment. Thus, without information of the background sediment, it is not possible to conclude the true mechanisms of PCBs degradation in the published paper.

Moreover, we argue the feasibility of the approach due to the missing analysis of the overlying water quality. Dissolved oxygen (DO) in the sediment-water-interfaces (SWI) is essential for throughout degrade PCBs after the dechlorinate reaction. However, the hypoxia/anoxia, has become a regular occurrence in many deep waters or eutrophic shallow waters, including inland lakes[4]. Under such low DO circumstance, LB400 may be deactivated for dechlorinate PCBs oxidation. Then, the appropriate method to delivery necessary oxygen unto the sediment to support the LB400 will become an important driving force[5]. If not, other oxidizers, such as NO_3^-, in the sediment may act as the electro acceptor like denitrification process, which could then drive significantly different the PCBs remediation process. The uncertainty of PCBs treatment process in the published paper could not be confirmed without the water quality data.

As mentioned above, this newly evaluated “Bioamended AC” material is likely only efficient for PCB-impact sediment remediation in specific shallow waters with low SO_4^{2-} content in the sediment and sufficient DO in SWI. The present data and results is not convincing enough to draw a conclusion with certainly general feasibility.

Notes

The authors declare no competing financial interest.

References

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