



allonnia™

Bioremediation of Oil Sands Process Water

Presented by – Dayal Saran

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May 8-11, 2023 | Austin, Texas

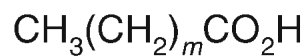
Oil Sands Process Water (OSPW)



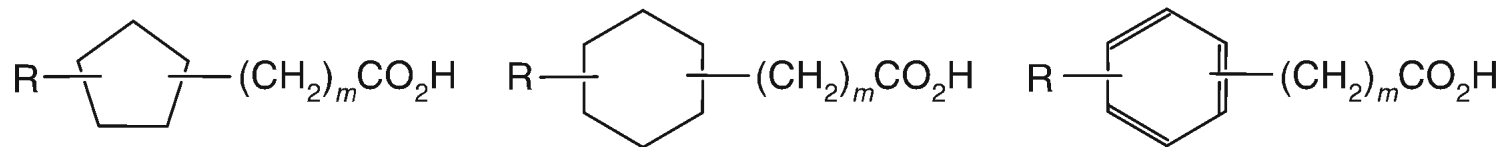
(Whitby et al. 2010– Images courtesy of Syncrude)

Naphthenic acids

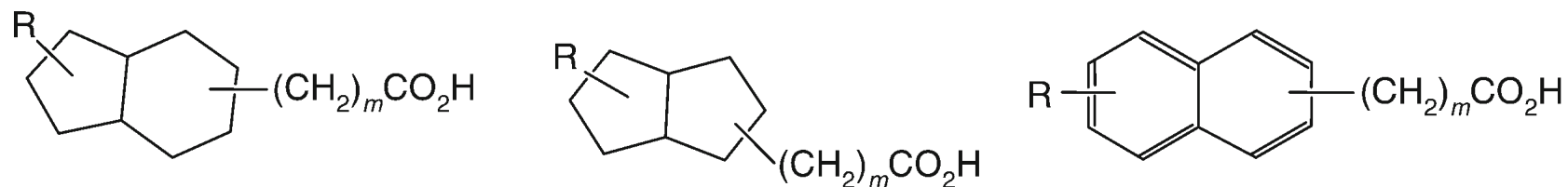
Acyclic $Z=0$



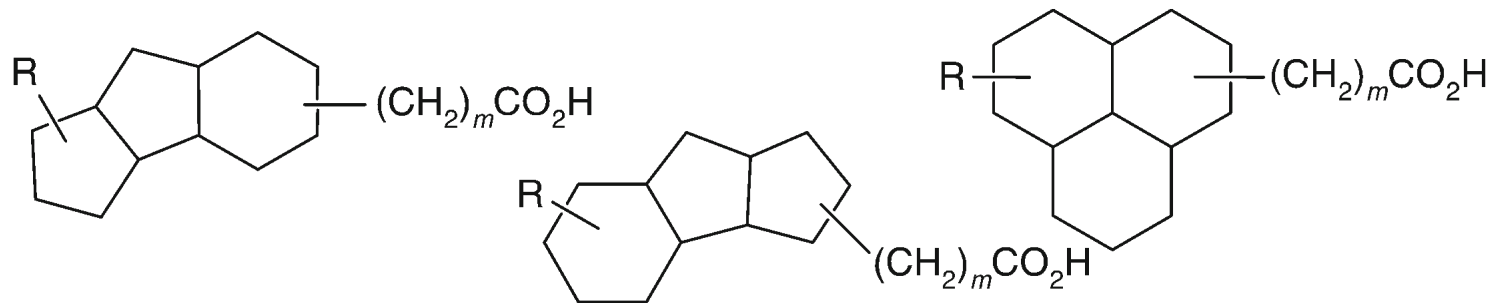
Monocyclic $Z=-2$



Bicyclic $Z=-4$



Tricyclic $Z=-6$

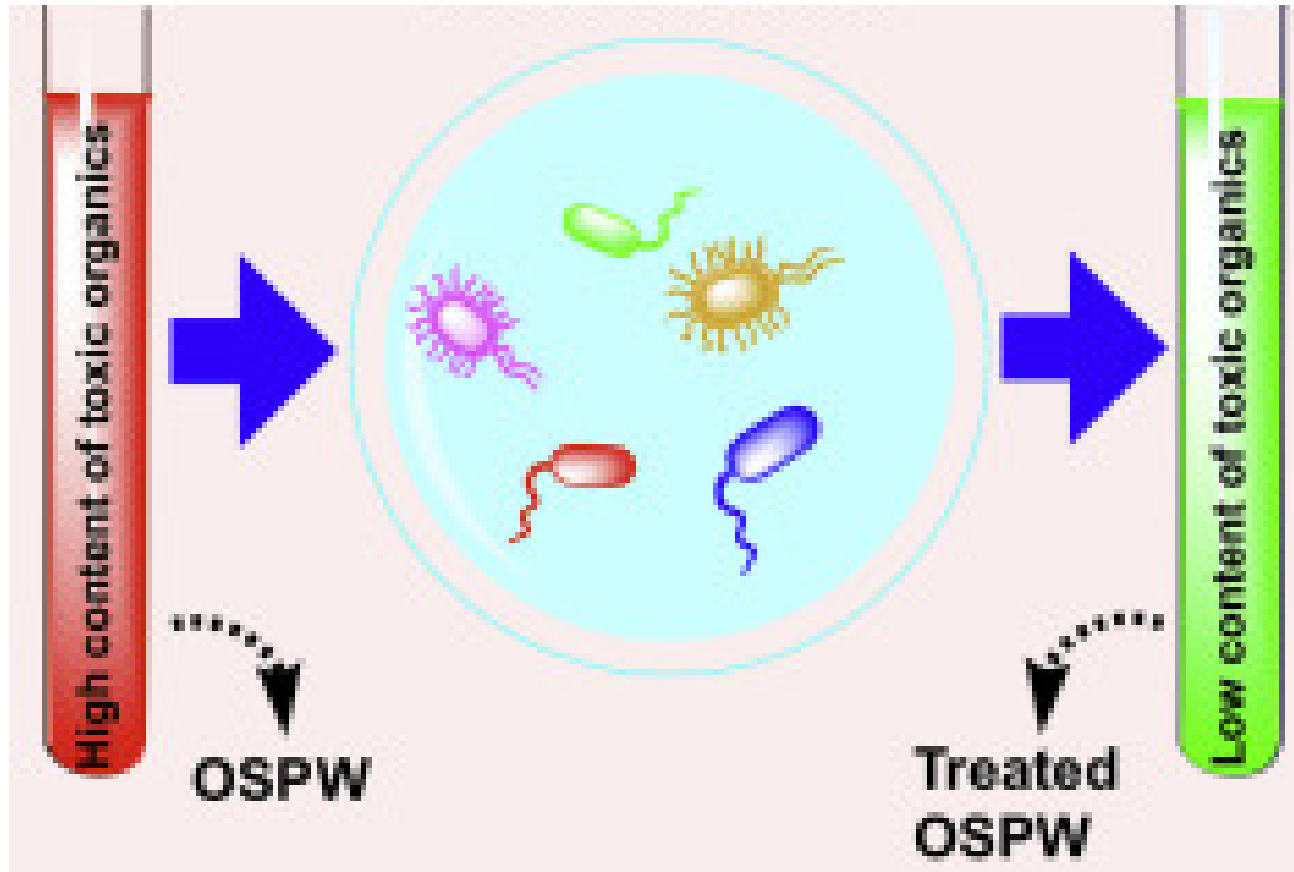


Overarching goal

Development of a low energy technology that is capable of detoxifying oil sands process water (OSPW) by removing/transforming naphthenic acids (NAs) and other toxic organic compounds found in OSPW.

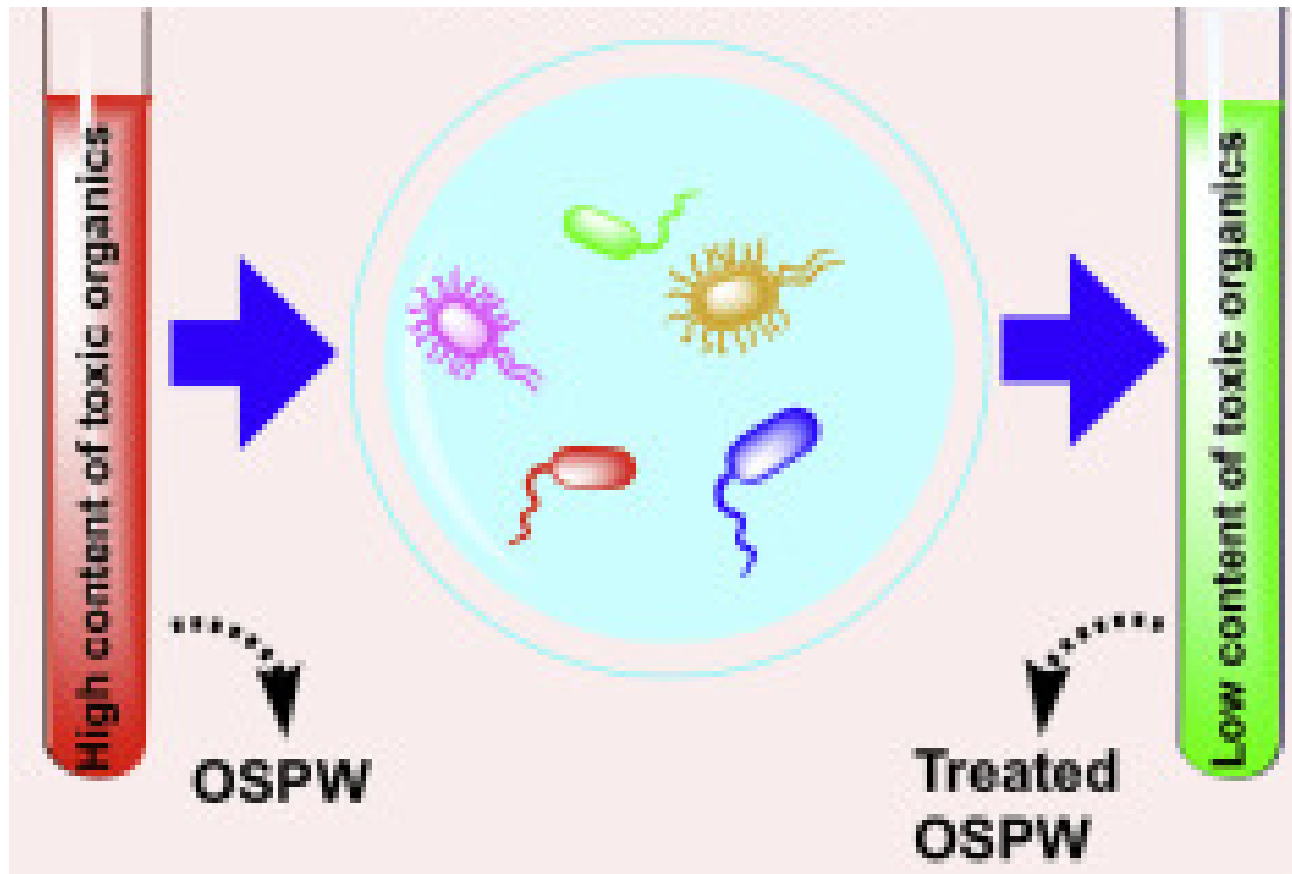


Biodegradation of NAs considered as a promising remediation technique



(Xue et al. 2018)

Biodegradation of NAs considered as a promising remediation technique



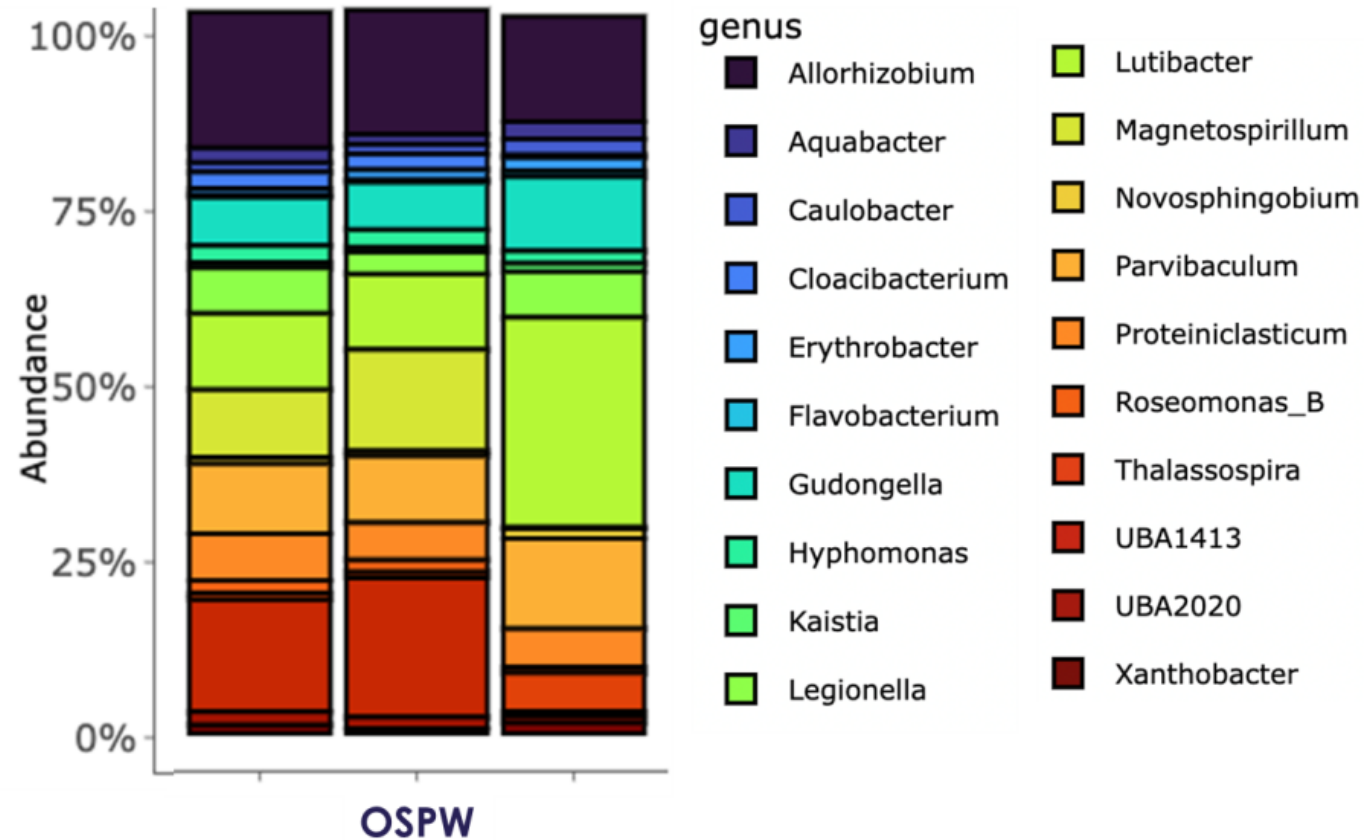
SUSTAINABILITY



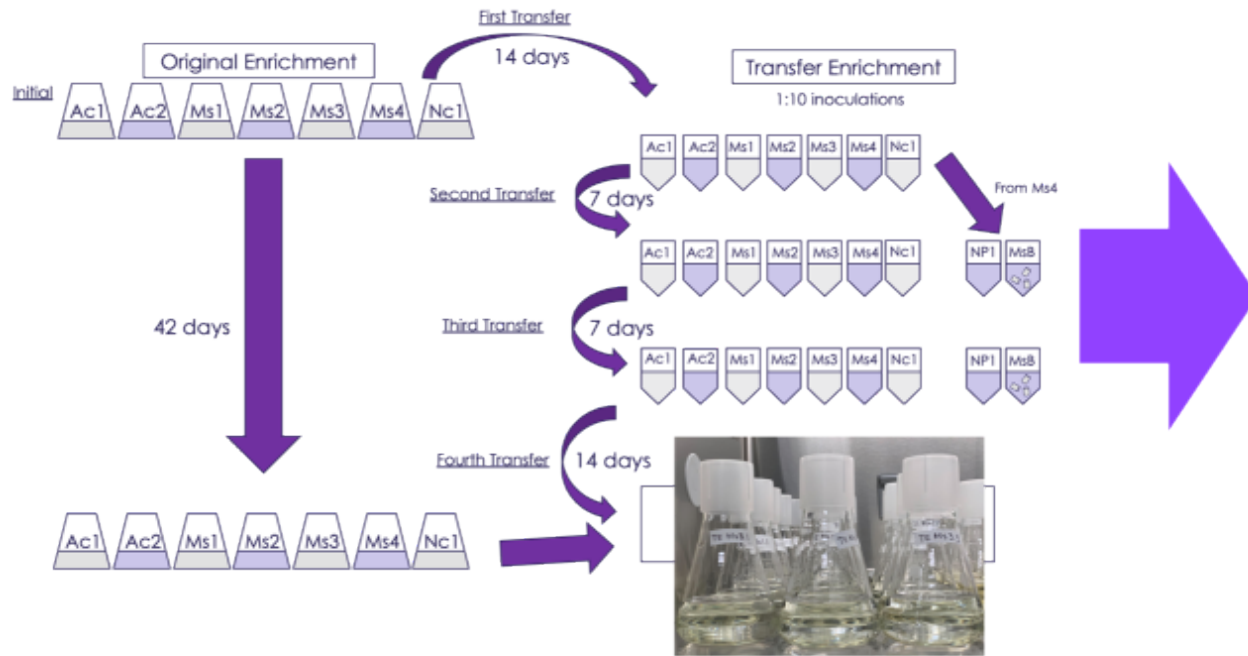
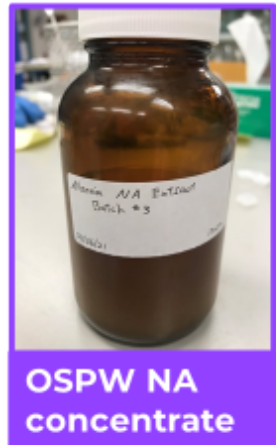
COST

OSPW is home to a diverse microbial community

20 most abundant taxa

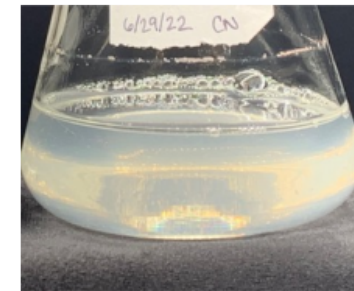
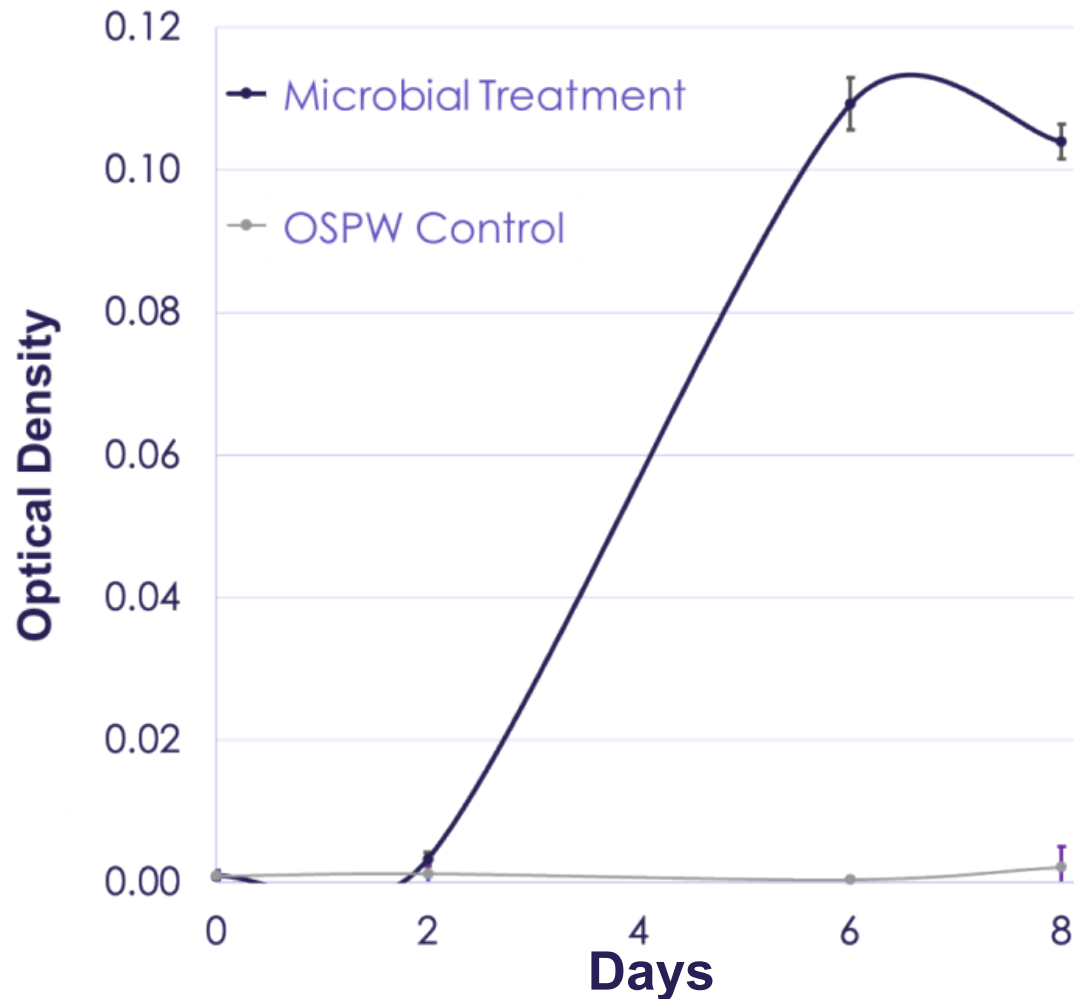


Microbial enrichments and isolations



Enriched microbial consortia from OSPW and isolated microbes from that consortia

Microbes are growing in OSPW

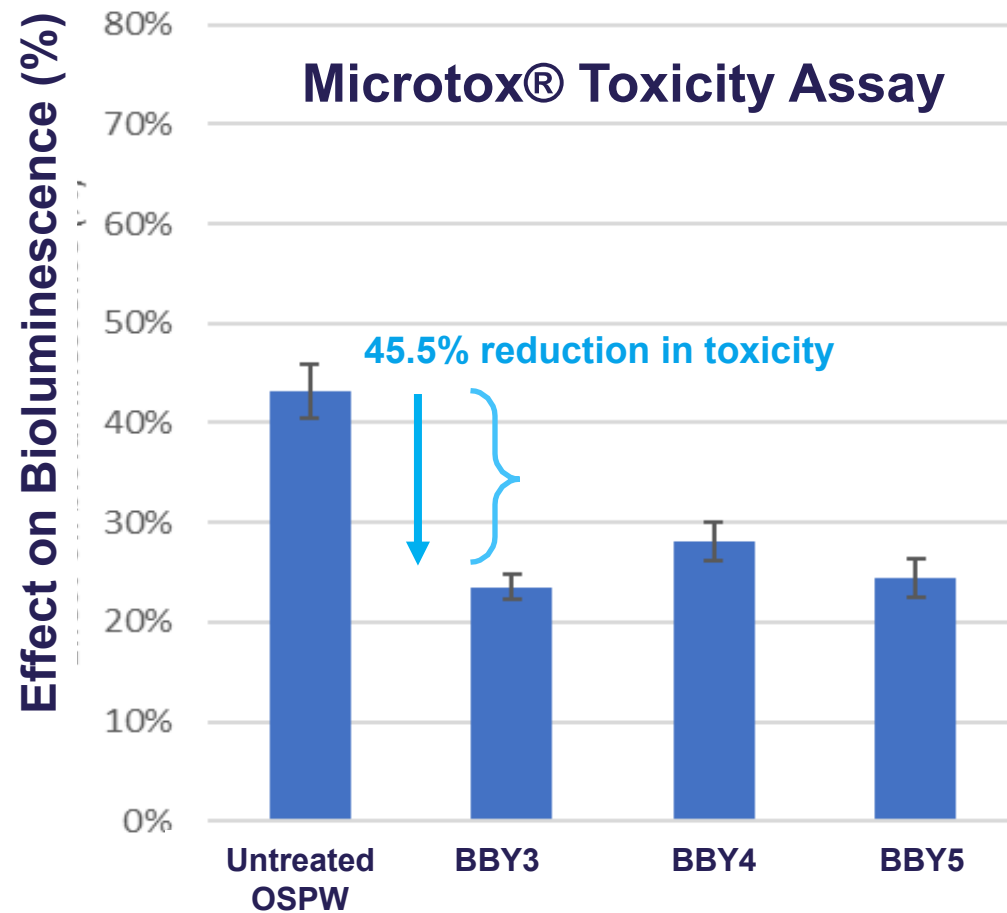


Microbial Treatment



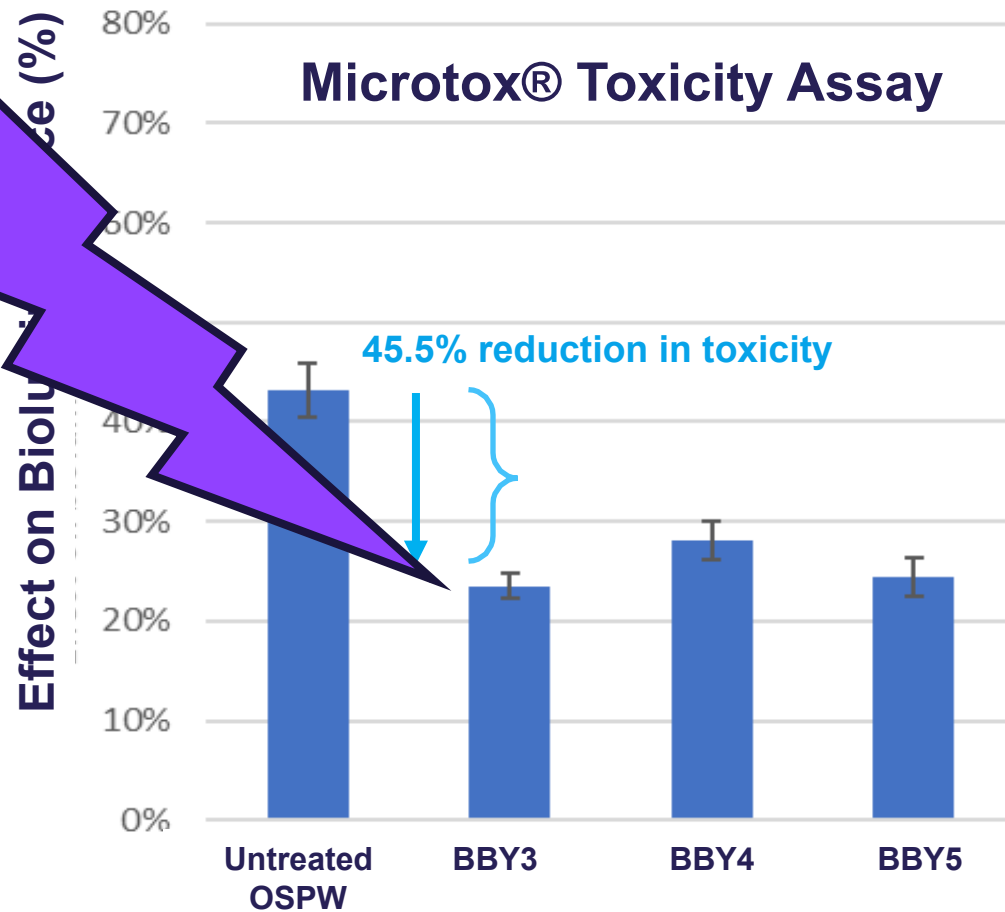
OSPW Control

Microbes are detoxifying OSPW

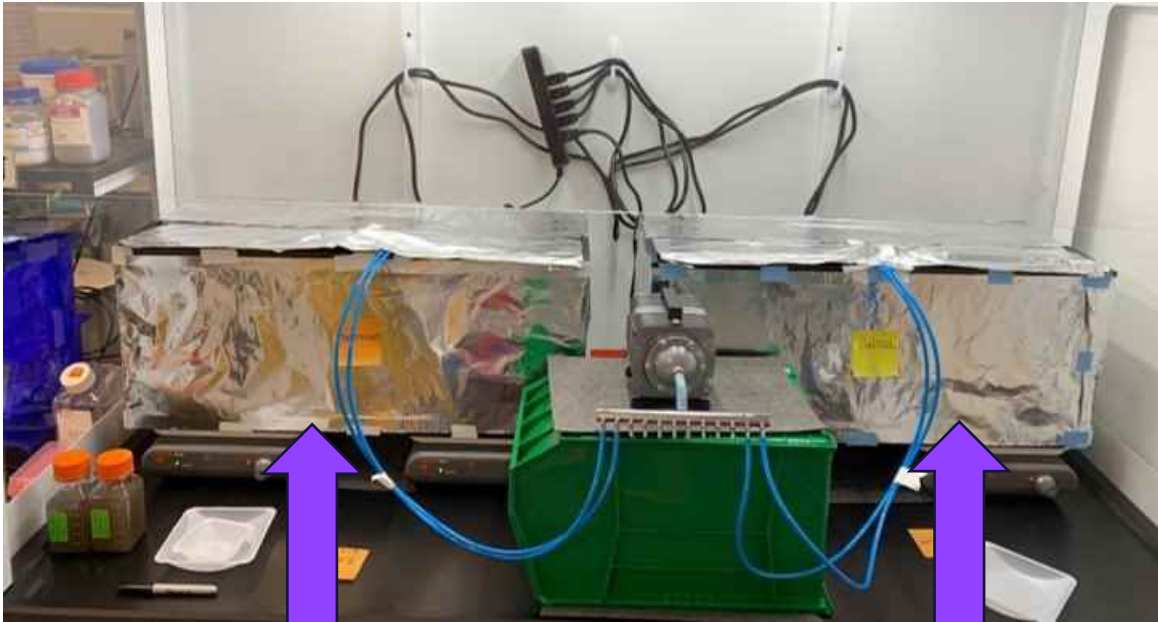


Microbes are detoxifying OSPW

1-WEEK

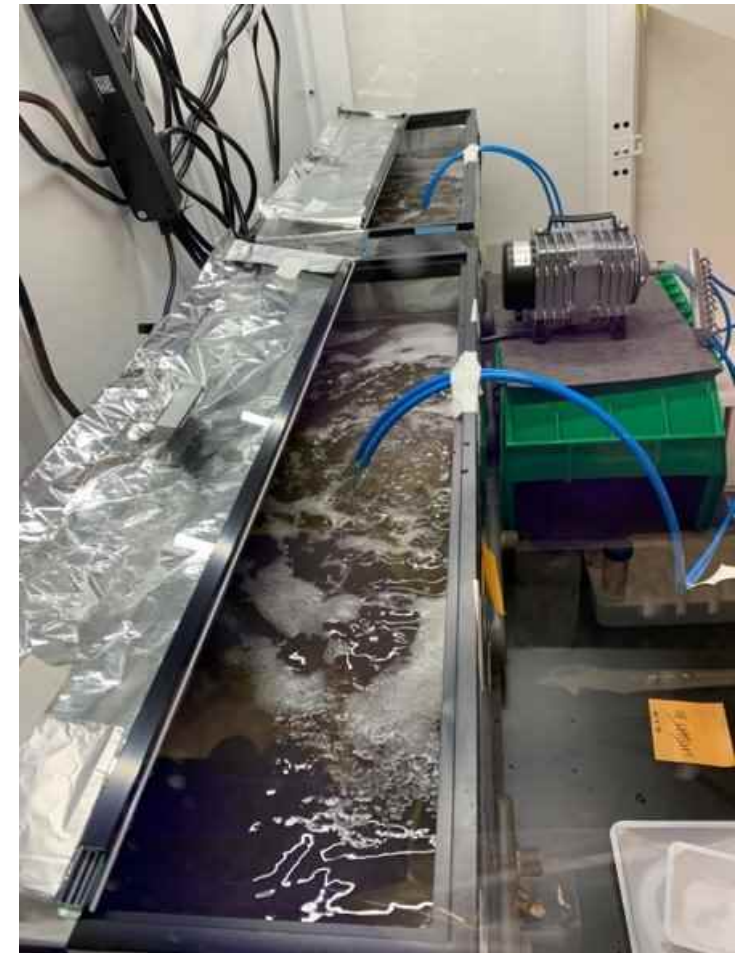


Scale-up of treatment for fish toxicity testing

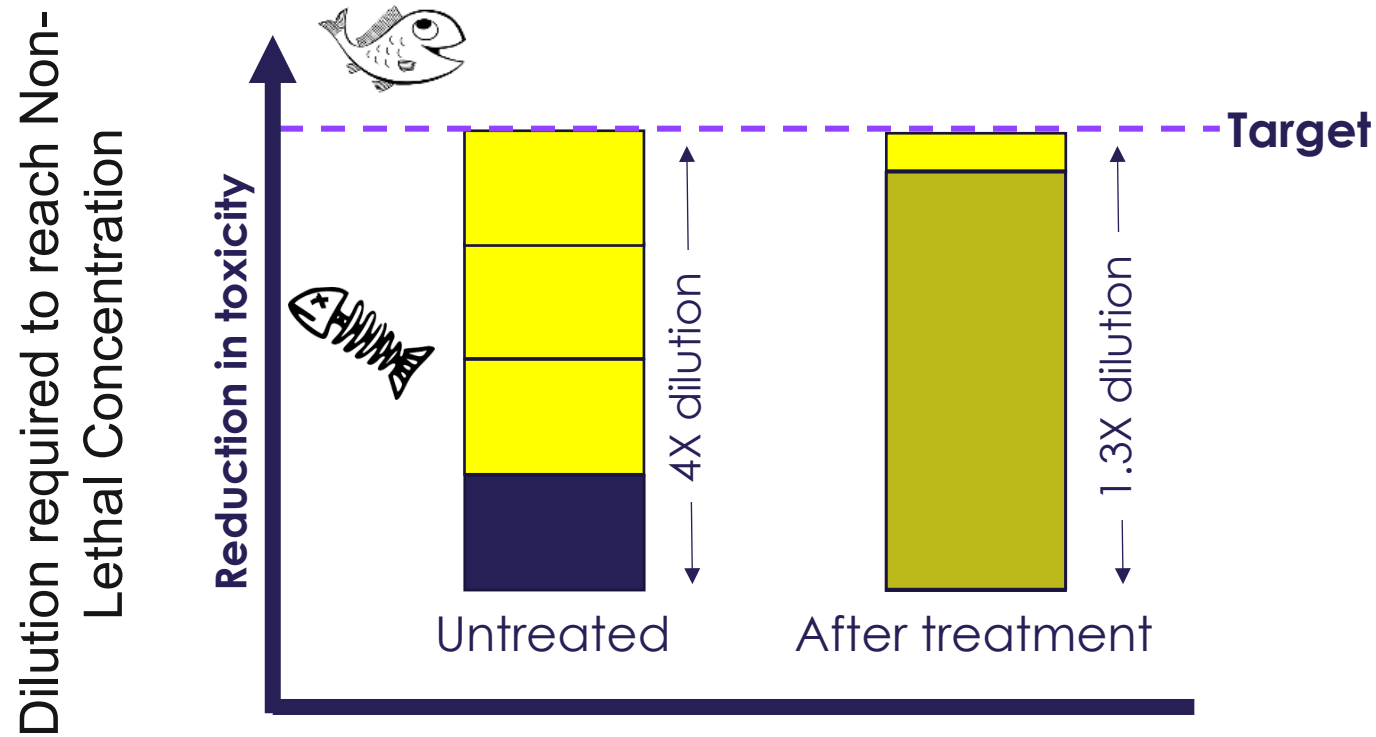


Microbial Treatment

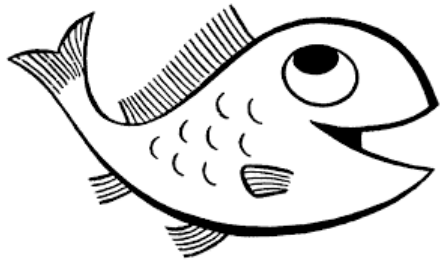
Control



Treatment of OSPW reduces Rainbow Trout Toxicity



Next steps



Achieve complete detoxification



Summary of KEY FINDINGS

- We identified several promising microbial consortia and isolates
- Our microbial treatment reduces toxicity of OSPW as measured by Microtox™ and Fish toxicity.
- Process was scaled from 200 mL flasks to 50 L tanks
- Microbial growth and corresponding toxicity reduction is fast; our entire process took 7 days
- We are further developing the process to completely eliminate toxicity and exploring deployment options

Acknowledgement

Allonnia Team

- Bryne Gramlich
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- Tyson Maynard
- Drine Gaspar
- Corey Nelson

Battelle Team

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- Aaron Frank
- Battelle enzyme team

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- OPE Group
- Innotech
- Suncor
- Syncrude
- COSIA



Thank you

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