Bioremediation of Oil Sands Process Water (OSPW)

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Background/Objectives. Naphthenic acids (NAs) naturally found in hydrocarbon deposits (petroleum, oil sands, bitumen etc.) are highly toxic organic pollutants comprised of alkyl-substituted, acyclic and cycloaliphatic carboxylic acids. The mining of oil sands generates large volumes of oil sands process-affected water (OSPW) containing toxic NA. Due to the high toxicity of NAs, OSPW stored in large tailings ponds cannot be released into regular water streams. While quarantining these toxic substances away from civilization and the environment is the standard method of dealing with OSPW during oil sands processing, it is not sustainable once operations cease, and regulations require treatment (degradation/detoxification) of OSPW for environmental discharge upon site closure.

Approach/Activities. Allonnia is rigorously seeking a more sustainable solution to this growing problem. Current Allonnia approach is to isolate and enrich native microbes from OSPW and test their ability to degrade NAs under different conditions.

Results/Lessons Learned. We have identified two bacterial consortia with the ability to degrade / detoxify the NAs within OSPW. We see significant reduction in the total organic carbon and more than 80% reduction in the toxicity using regulatory compliant toxicity measurement assay. The study used both microbial genomics as well as laboratory analysis to identify the microbes responsible for degradation and to quantify the effectiveness of detoxifying NAs. To the best of our knowledge, our method showed significant improvement in detoxification / degradation over other methods currently being tested.