Assessing the Efficacy of a Remediation Product for Degrading Polycyclic Aromatic Compounds (PACs) After Spills of Conventional Heavy Crude Oil into Freshwater

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Conventional heavy crude oil (CHV) is a common oil product transported through pipelines to markets for shipping or refinement. In the scenario of an aquatic oil spill, remediation of affected environments is a crucial consideration. EcoBioClean ® (EBC) is a proprietary lyophilized product consisting of nutrients, dispersants, and bacterial inoculant applied to oil spill affected areas as a passive remediation technique. The fate of polycyclic aromatic compounds (PACs) and nutrients (C, N, & P) are important factors during remediation. We assessed the efficacy of EBC for remediating PAC concentrations in model freshwater systems affected by oil spills. Twelve glass beakers, containing 1 litre of lake water and 100g of wet sediment, collected from Lake 260 at the IISD Experimental Lakes Area, were treated in triplicate with either a) weathered CHV and EBC, b) weathered CHV only, c) EBC only, d) untreated control systems. Water sampled on days 0,1,4,9,16, and 32 was analyzed immediately for photoelectric chemical oxygen demand (peCOD), while samples for parent, as well as alkylated PACs (aPACs) were extracted the same day for future analysis using GC-MS/MS. Bulk sediment for PAC analysis, as well as water for nutrient chemistry, was sampled on days 0 and 32. peCOD measures detected significant differences in the dissolved fraction at T1 (control=17.76 ± 4.61 mg/L, EBC=223.59 ± 8.71 mg/L, CHV=24.09 ± 2.05 mg/L, EBC+CHV=168.65 ± 21.34 mg/L). Over 90% of observed PACs were alkylated. EBC treated oil resulted in lower C2 naphthalene concentrations by day 32 (EBC+CHV=76±23 ng/L, CHV=556±129 ng/L) as well as lower C3 napthalene concentrations (EBC+CHV=173±15 ng/L, CHV=668±33 ng/L). Ongoing analysis is being undertaken on sediment PAC concentrations, and additional aPACs to support these initial results, which indicate an increase in degradation of PACs and dissolved organic carbon in EBC+CHV treatments compared to CHV treatments.