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## Detection of Crude Oil Contamination in St-Lawrence Estuary Sediments Using n-Alkanes and PAHs Diagnostic and Isotopic Ratios

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Excessive consumption of petroleum and crude oil for energy purposes has resulted in the contamination of many natural systems and waterways. However, determining the presence and level of contamination has been difficult due to the presence of naturally occurring hydrocarbons and to the complexity of the molecular fingerprint of petroleum and crude oils. Naturally occurring straight-chain n-alkanes and polycyclic aromatic hydrocarbons (PAHs) in sediments are both commonly used to determine organic matter sources through diagnostic and isotope ratios, and these ratios are affected by the presence of petroleum and crude oil. As such, they offer a potential avenue for determining whether crude oil contaminants are present in natural systems. The purpose of this project was to determine whether diagnostic ratios of n-alkanes and of PAHs as well as compound-specific isotope ratios of n-alkanes ( $\delta^2\text{H}_{\text{alk}}$  and  $\delta^{13}\text{C}_{\text{alk}}$ ) could be used to detect crude oil or petroleum contamination, and at what level of contamination the difference becomes significant. This was accomplished by separating the aliphatic and aromatic fractions of the natural and crude oil hydrocarbons by column chromatography, spiking natural sediment hydrocarbons with crude oil hydrocarbons at different levels, and analyzing the samples by GC-MS (Gas Chromatography-Mass Spectrometry) and by GC-IRMS (Isotope-Ratio Mass Spectrometry). The isotopic ratios and the hydrocarbon concentrations were determined by external standard calibration, and the diagnostic ratios were then calculated from the concentrations. Both ratios were then evaluated for their efficiency in detecting the presence of crude oil contamination.