Corexit dispersants / BP Crude mix increases polynuclear aromatics levels in water & marine life in the Gulf of Mexico

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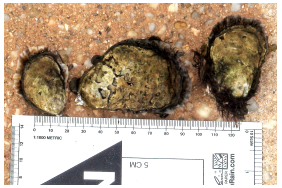
Sea Nettles 46.0 mg/Kg PAHs
Gulfport, MS



Above: Oysters had up to 2.6 mg/Kg PAHs & 4,390 mg/Kg TPH

Red Snapper 87 mg/Kg TPH in filet & 2,790 mg/Kg in viscera. Pensacola, FL

Crab viscera sample, Crabs had TPH at 3,583 mg/Kg & PAH at 0.162 mg/Kg, Terrebonne Island, LA

Hypothesis: The mix of dispersants and crude oil in the Gulf of Mexico stabilized petrogenic polynuclear aromatic hydrocarbons, (PAHs), in the water column, making these PAHs more available for uptake by marine organisms.

Abstract: The Deepwater Horizon rig was destroyed on April 20, 2010, Methane gas escaping from the well rose to the surface, and exploded, killing 11 oil field workers, and released approximately 200 million gallons of crude oil, 2 million gallons of dispersant, plus an unknown quantity of methanol, hydrogen sulfide, radon, and methane. The use of dispersants stabilizes polar compounds in water, effectively causing crude oil to break up, dissolve, and dilute.

Methods: PAHs were measured in shallow subsurface seawater samples collected from Port Fourchon, Louisiana, Barataria Bay, Louisiana, St. Petersburg, Fl, and in mixtures spiked with Corexit dispersants and 0.4 % BP Macondo Well crude oil in unfiltered Gulf of Mexico seawater. Dispersant to crude oil ratios in water ranged from a minimum of 0:1 to a maximum 1:10. PAHs were analyzed by GC-FID and high resolution GC-MS. Marine organisms were tested by GC-FID and GC/MS with GPC clean up. Lipid-free TPH in organisms were compared to water column TPH samples to match chromatographic peaks to exclude biogenic oils and greases. BP crude was identified through forensic use of biomarkers in known BP MC 252 samples.

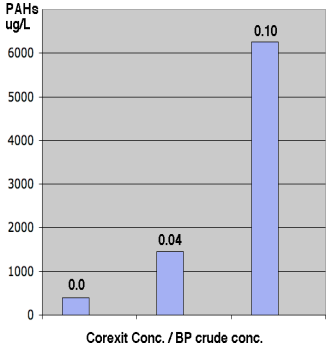
A total of 44 water and 87 grab and composite marine organism samples, (oysters, blue crabs, sea nettles, tunicates, crab megalopes, and fin fish), were analyzed. Support for this study was received from D. Pelligrino and J. Bergendahl of WPI, Smith Stag, LLC, NALCO Energy Systems, Krupnick, Campbell, Malone, Buser, Slama, Hancock, Liberman and McKee, The Sea Shepherd Conservation Society, and the Louisiana Environmental Action Network.

Conclusions:

$[PAH]_{water}$ was directly dependent on the $[Corexit]_w$ to $[BP\ crude]_w$ ratio, resulting in a 16 times increase in water column contamination at the maximum dispersant dose rate, with constant $[BP\ crude]_w$.

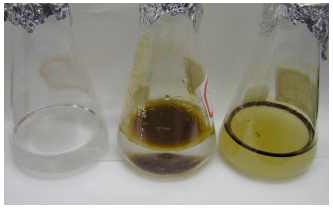
Corexit contributes significantly to water column TPH.

Marine organisms, including commercial seafood species, show increased tissue [PAH] and [TPH] in waters contaminated with BP crude and dispersants.



Seawater contaminant	PAH_w (ug/L)	TPH_w (mg/L)
seawater, (sw), only	<1.0	< 0.05
sw w/visible floating crude	10.7	1.3
sw + tarballs	0.1	< 0.05
sw + tarballs + 1:25 Corexit	0.5	87.
sw + 0.04 % Corexit	< 2.2	76.
sw + 0.4 % BP crude	392.	5.1
sw + 0.4 % BP crude + 1:25 Corexit	1,451.	78.5
sw + 0.4 % BP crude + 1:10 Corexit	6,253.	397.

Juvenile crab in methylene chloride, fluorescing at 365 nm.



L to R: Blank, BP Crude, BP Crude + Corexit

L: Corexit + BP Crude, R: BP Crude alone

Port Fourchon, LA, oil-contaminated shallow subsurface seawater, 10.7 ug/L PAHs