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Emulsions Produced after Oil Spills: Their Fate in Estuaries and Effects on the Grass Shrimp, *Palaemonetes pugio* and Blue Crab, *Callinectes sapidus*

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ABSTRACT

Stable water-in-oil emulsions, often formed after oil spills, contribute to the difficulties of cleanup due to their persistence and high viscosity. The objectives of the present study were to determine the fate and effects on grass shrimp (*Palaemonetes pugio*) and blue crabs (*Callinectes sapidus*) of such emulsions after they enter estuaries. To achieve this objective, non-emulsified oil and stable emulsions, formed from Kuwait crude oil, were added to estuarine mesocosms, followed by exposure of Richard F. Lee, Keith Maruya, Ulrich Warttinger et al. grass shrimp (*Palaemonetes pugio*) to treated sediments. The polycyclic aromatic hydrocarbon (PAHs) concentrations in the mesocosm with emulsified oil decreased from 284 to 7 μg/g sediment in 56 days, while in the mesocosm with non-emulsified oil the PAHs decreased from 271 to 0.2 μg/g sediment over this same time period. Reproduction parameters (ovary development, embryo production) of grass shrimp were affected as result of exposure to sediments with emulsified oil, including no embryo production (Day 14 sediments) and reduced embryo production (Day 36 sediments). In contrast, grass shrimp reproduction parameters were not affected after exposure to sediments with the same concentration of non-emulsified oil. It is suggested that the persistence of emulsified oil explains the observed effects. Exposure of grass shrimp embryos to pore water from emulsified oil sediments resulted in significantly more DNA strand breaks and reduced embryo hatching rates compared to reference controls or to sediments with non-emulsified oil. In addition to work with oiled sediments, a histological study was conducted on blue crabs fed food containing emulsified oil. The most notable effect was distended hemocytes with large amounts of glycoproteins in the hepatopancreas. It is speculated that crabs with these distended hemocytes are less able to deal with invading microbes, since crab hemocytes are an important part of the crab's immune system. This study suggests that the entrance of water-in-oil emulsions into estuaries can effect grass shrimp reproduction. Procedures that inhibit emulsion formation, thus preventing emulsified oil from entering estuaries, should be considered after oil spills.

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