OIL DISPERSANT

Overview

Oil dispersants are a common tool used after oil spills to break up oil slicks on the water surface and increase the oil's rate of biodegradation. By breaking up large slicks, oil dispersants are intended to reduce harmful oil exposures to birds, fish, and other wildlife in proximity to spills. Two oil dispersant products were used heavily in the BP oil leak: COREXIT 9500 and 9527, both produced by Nalco. BP used over 1,800,000 gallons of dispersant since the start of the oil leak (Buchanan).

How Oil Dispersants Work

Oil dispersants work by separating an oil slick into small droplets of oil. Wind, waves, and other turbulence in the water break up these droplets and disperse them throughout the water column. Once dispersed, the oil droplets are consumed by naturally occurring bacteria or they are carried out into the open ocean. The goal of using oil dispersants is to protect fragile coastal areas from oil coming ashore.

The Chaos of Cleanup: Analysis of the Potential Health and Environmental Impacts of Chemicals in Dispersant Products

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This report highlights key findings from research on the 57 chemicals found in the oil dispersant products listed by the EPA as appropriate for use in response to oil spills. Additionally, the report disects issues of concern with the approval process for dispersant products and makes suggestions on improving regulations so that the safest dispersant is used in each unique spill.

Oil Dispersant Glossary

Throughout the oil dispersant section you may come across a word, phrase, or abbreviation that you are not familiar with. Visit the oil dispersant glossary for definitions and explanations of these terms.

Oil Dispersant Chemicals

There are a total of 57 chemical ingredients that are found in the oil dispersant products approved for use by the US Environmental Protection Agency. View a chart of the **potential effects on human health and the aquatic environment**.

Oil Dispersant Products

Click on a product name for information on the chemicals found in it, potential effects on human and environmental health, as well as data on its effectiveness at dispersing oil.

	Oil Dispersants	
BIODISPERS (AKA PETROBIODISPERS)	JD-109	NOKOMIS 3-AA
Corexit 9500	JD-2000	NOKOMIS 3-F4
Corexit 9527	MARE CLEAN 200	SAF-RON GOLD (AKA SF GOLD)
DISPERSIT SPC 1000 (AKA SEACARE)	NEOS AB3000	SEA BRAT 4

Environmental Toxicity

Oil dispersants begin to break down within 16 days of application in aquatic environments (CDC 2010).

Dispersing oil can have both positive and negative impacts on the environment and wildlife. "They expose marine life in the water column to more oil than would be the case for untreated oil, which floats at the surface" (Torrice 2010.) However, "Oil in the water column...won't reach wetlands on shore, where it could wreak greater havoc" (Torrice 2010).

The potential environmental impacts of oil dispersants are dependent on various factors, described below.

Species of Wildlife

- Different species of aquatic wildlife react differently to oil dispersant exposure, as evaluated by the exposure level that causes a 50% mortality rate under particular exposure conditions. For example, grass shrimp can withstand exposure to higher concentrations of Corexit oil dispersants than the Pacific oyster. Analysis of tests done on a variety of species of aquatic life show that crustaceans (a group of animals including crabs, shrimp, and barnacles) are more sensitive to oil dispersant exposure than fish (George-Ares, 2000).
- One study found that the species with the least amount of protective shell or external tissue are most sensitive to oil dispersant exposure (Scarlett et al., 2005).
- Another study found that the use of oil dispersants increased the levels of hydrocarbons, which are found in crude oil, in rockfish. Fish exposed to high levels of hydrocarbons may show changes in their physiology. Study researchers state that similar effects could be seen in other ovoviviparous fish, fish that give birth to live young instead of eggs (Jung et al., 2009).
- A study was performed to see if the use of oil dispersants affected fish intake of PAHs (polycyclic aromatic hydrocarbons, a chemical compound that exists in oil). Researchers found that the use of oil dispersants did in fact increase exposure and uptake of PAHs by fish, especially fish that live throughout the water column of coastal areas, the ocean, and lakes. They also state that "the risk of PAH toxicity ... especially to sensitive life stages such as eggs and larvae, is enhanced by chemical dispersion (Ramachandran et al., 2003)." "Concentrations of LMWPAHs and HMWPAHs (low and high weight PAHs) are higher in the water column following application of chemical dispersants to surface slicks" (Couillard et al. 2004).
- PAHs have been studied and shown to cause cardiac problems, abnormal accumulations of fluid in the body, and spinal and cranial deformation of fish embryos (Incardona et al., 2004). Chronic exposure to PAHs has also been shown to cause increased rates of parasite infection, which may cause disease and death in fish.

Life Stage of Wildlife

- Early life stages of aquatic organisms (embryo, larval, and juvenile) have a higher sensitivity to oil dispersants. The George-Ares study states, "Corexit 9500 and Corexit 9527 are moderately toxic to early life stages of fish, crustaceans, and molluscs." Studies have shown that the age, down to the hour, can have an impact on the species' level of sensitivity to oil dispersants. For example, "Herring eggs at time of fertilization were more sensitive to the dispersants ... than herring eggs 6 hours after fertilization" (the herring eggs were exposed to a different type of oil dispersant) (George-Ares, 2000).

Duration of Exposure

- The longer the period of exposure to oil dispersants is, the worse the impacts on particular species can be. In several studies, species continually exposed to oil dispersants for a 96-hour period were more susceptible to a 50% mortality rate than species exposed to oil dispersants just one time. Releasing oil dispersants into the water for days, weeks, or months at a time will increase the dispersants' level of toxicity.
- In a study that compared the toxicity of oil, dispersants, and oil plus dispersants on shrimp, minnows, and silverside fish, researchers found that oil plus a dispersant, in this case Corexit 9500, had an equal or lower toxicity than just the oil. However, this test was to reflect a one-time application of dispersant. When dispersant is continuously applied, effects of toxicity are more readily seen in the test species. The longer the dispersant is applied, the more toxic it becomes (Fuller et al., 2004).

Water Temperature

- Studies have shown a direct correlation between water temperature and wildlife's sensitivity to oil dispersants. The warmer the water is, the more toxic the oil dispersants are to aquatic life. In studies, both grass shrimp and scallops were able to withstand significantly higher concentrations of oil dispersants in water at lower temperatures. A 10 to 20C degree increase in water temperature dramatically increased their sensitivity to oil dispersants (George-Ares 2000).
- Current Gulf of Mexico Water Temperatures from NOAA

Concentration of Dispersant

- The higher the concentration of oil dispersants in water, measured in parts per million (ppm), the more likely it is for the dispersants to affect wildlife. Certain species can withstand very high concentrations of oil dispersants, while others show negative impacts at very low concentrations. Negative effects on particular aquatic species have been shown to be reversible at low concentrations, but the higher the concentration, the more likely that the effects will be irreversible (Scarlett et al., 2005).
- The maximum recorded concentration of oil dispersants in open water is 13ppm (Scarlett et al., 2005). Studies have shown that in many cases the oil dispersant concentrations are less than 1 ppm within hours of application (George-Ares 2000).

Geography and Type of Water Body

- Areas where water is more stagnant or protected, such as estuaries, enclosed bays, and reefs, are more susceptible to high concentrations of oil dispersants than more open or large bodies of water.Without wave action and turbidity, oil dispersants have a lower rate of dissipation

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