

# Oil dispersants' effects still largely a mystery

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A clean-up worker applying Corexit 9500 oil dispersant to the Gulf spill. Image credit: NOAA

In the wake of the BP oil spill, gaping questions remain about a key tool used during cleanup: the nearly 2 million gallons of chemical dispersants sprayed over the water or onto the gushing wellhead on the seafloor. Do the chemicals help recovery, hinder it -- or neither?

Just as dishwashing detergent breaks grease on dirty plates into bits, dispersants help turn a slick of [oil](#) into droplets a hair's breadth in size. In droplet form, oil is more easily pulled under by currents, away from birds, otters, seaweed and other marine life near the surface. And because droplets present a greater surface area of oil to water, dispersants should, in theory, permit microbes to chew up oil far faster.

Yet despite more than half a century of dispersant use in oil spill

cleanups, the long-term effects that dispersants or dispersant-treated oil have on marine life remain as opaque as a layer of crude.

Scientists say they still don't know whether dispersants truly enable bacteria to digest spilled oil more quickly or whether dispersed oil is safer for marine life than untreated slicks.

They can't say whether it was a help or hindrance that BP decided to spray much of the dispersant not onto the water surface, as is more common, but over oil pouring out of the leaking wellhead 5,000 feet under the sea. Both the high pressure (151 times greater than at the surface) and the oil's temperature (100 degrees Celsius, or 212 degrees Fahrenheit) could have affected dispersant action, either for better or worse.

The size of this spill also made it a standout. An estimated 4.9 million barrels of oil were released, about 19 times the amount in the 1989 Exxon Valdez disaster off Alaska and significantly more than the 1979 Ixtoc spill off the Mexican coast, in which about 3.5 million barrels of crude spilled into the Gulf of Mexico.

"On a scale of the Deepwater Horizon blowout, we don't know for a whole variety of reasons how well dispersants have worked," said Neal Langerman, founder of consulting firm Advanced Chemical Safety.

Bacteria do seem to be digesting the oil in the Gulf of Mexico, according to an Aug. 25 report, but data are mixed on whether dispersants help bacteria along. Mervin Fingas, a retired scientist with the Canadian government, said that of roughly 40 biodegradability studies he surveyed between 1997 and 2008, about 60 percent said dispersant retarded growth of oil-eating microbes and 15 percent reported no effect. The remaining 25 percent noted a positive effect.

But positive findings are open to interpretation. At a 1999 oil spill conference, researchers reported that microbial populations dining on oil treated with the dispersant Corexit 9500 (used by BP in the Gulf) grew more than seven times as large as those eating oil dispersed physically, suggesting the bacteria were helping.

Yet a comprehensive 2005 review of dispersants by the National Research Council concluded that the healthy bacterial growth in such studies could easily be due to microbes feeding on dispersant, not oil. "There is no conclusive evidence demonstrating either the enhancement or the inhibition of microbial biodegradation when dispersants are used," the 12 authors wrote.

Some confusion comes from the diversity of dispersant formulas, Fingas said. Some contain chemicals that bacteria prefer to digest. Others block the ability of some microbes to attach to oil droplets and start feeding on the hydrocarbons.

The primary purpose of dispersants is to move oil away from surface-dwelling marine life. In the case of the BP well blowout, because the application was deep under the sea, much of the oil never rose to the surface -- which means it went somewhere else, said Robert Diaz, a marine scientist at the College of William and Mary in Williamsburg, Va.

"The dispersants definitely don't make oil disappear. They take it from one area in an ecosystem and put it in another," Diaz said.

The types of [dispersants](#) used today are far less noxious than the industrial-strength degreasers used in the past, said Beth McGee, a senior water quality scientist at the Chesapeake Bay Foundation, a nonprofit conservation group in Annapolis, Md., and a coauthor of the 2005 review. Most studies find them nowhere near as harmful as oil, she said.

But the concern is that dispersed oil may do more harm to marine life than oil left alone. And on this point, findings vary widely, in part because lab tests have limitations, said Andrew Nyman, a Louisiana State University professor. In small containers, dispersed oil can't dilute. Studies look at large, quick effects, such as death or deformity. Results depend on the oil type, whether it's fresh, the dispersant, the animal being studied and its life stage.

Studies show that zooplankton, oysters and crustaceans may eat dispersed oil droplets, which can match the size of their food. Dispersed oil can cause premature hatching in Pacific herring, block barnacles' ability to react to light and worsen oil's harmful effects under sunlight. Larval stages are particularly sensitive, as are gills of fish, squid, crabs and oysters, said environmental biochemist Arne Jernelov of the Swedish Institute for Future Studies in Stockholm, who led a United Nations team examining the 1979 Ixtoc spill.

Yet many studies find dispersed oil is no worse, or worse only under certain conditions. A 2001 study by researchers at ExxonMobil Biomedical Sciences found that oil dispersed with Corexit 9527, also used on the BP spill, was twice as toxic to the inland silverside, an estuarine fish -- but not if that crude had been exposed to the elements. Such weathered oil, when dispersed, was 10 times less harmful than undispersed oil.

And on Aug. 2, the Environmental Protection Agency announced that its lab tests had uncovered relatively little difference in toxicity to the inland silverside and crustaceans called mysid shrimp of several different oil-dispersant mixtures compared with oil alone. EPA scientist Paul Anastas said dispersant use "seems to be a wise decision" and that "the oil itself ... is enemy No. 1."

This jumble of findings has led to disagreement among experts that

might be resolved by careful analysis of real-life cleanups, which hardly ever happens, said Larry McKinney, executive director of Texas A&M University's Harte Research Institute for [Gulf of Mexico](#) Studies in Corpus Christi, Texas.

Funding for such studies "waxes and wanes with [oil spills](#), but never seems to follow through," McKinney said. Many investigations were launched after the Ixtoc spill to explore the effects of dispersed oil, he added.

But funding, and science, dried up when the well did.

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