

Combination of Gulf oil and dispersant spell potential trouble for gut microbes

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A study to be published in *mBio*, the online open-access journal of the American Society for Microbiology, on Tuesday, October 23, examined whether crude oil from the 2010 Deepwater Horizon oil spill, the dispersant used on it, or a combination of the two might affect the microbes of the human digestive tract. The researchers found that although high concentrations of oil combined with dispersant are detrimental to these helpful microbial communities, the low to undetectable concentrations typically found in Gulf shellfish had no discernable effect.

"The oil and the [dispersant](#) were not hazardous or toxic to the bacteria [at the tested concentrations], but when you combined them and increased the concentrations, you got a dose-response effect," says Carl Cerniglia of the National Center for Toxicological Research at the U.S. [Food and Drug Administration](#) (NCTR, FDA), a senior author on the study.

The Deepwater Horizon oil spill released roughly 4.9 million barrels of [crude oil](#) into the northern [Gulf of Mexico](#) in the spring and summer of 2010. To accelerate dispersion and enhance breakdown of the oil by microorganisms, 1.5 million gallons of the dispersant COREXIT 9500 were sprayed on the surface of the spill and applied at the underwater source of the leak. Concerns were soon raised about the safety of that dispersant for wildlife, plants, and humans alike. Oysters, shrimp, and other delicacies could well bioaccumulate oil or dispersant in their tissues, so eating contaminated shellfish presents one possible route by

which humans could be exposed.

Although studies of the toxicity of crude oil and COREXIT 9500 to the human body have been carried out, science has not explored whether the dispersant or a mixture of oil and dispersant could have an impact on the microorganisms that line our intestinal tracts and aid in digestion, enhance immunity, and manufacture essential vitamins that the body absorbs.

Cerniglia and his colleagues combined human [fecal samples](#), which are loaded with the microorganisms that reside in the intestines, with varying quantities of Deepwater Horizon crude oil and the dispersant, and then tested the samples to see how the [microorganisms](#) fared.

The crude oil and dispersant together had a greater toxic effect on the [microbes](#) present in the fecal samples, says Cerniglia, apparently because the dispersant is doing what it was designed to do: break up the oil blobs into smaller blobs with greater surface-to-volume ratios and greater bioavailability. "By adding the dispersant to the crude you're solubilizing the oil, which may make it more bioavailable to the organisms and create a potentially toxic response."

The oil and dispersant affected some types of bacteria more than others, says Cerniglia. In fecal samples from all three volunteers in the study that were treated with oil and dispersant, the abundance of *Escherichia coli* increased while the abundance of *Bacteroides uniformis* and uncultured *Faecalibacterium* were reduced. This is important because high densities of *E. coli* have been associated with greater susceptibility to foodborne infections.

Cerniglia cautions that although the findings reveal that dispersant and crude oil together can have a negative impact on the human microbiome, it is important to note that the concentrations of these materials in

seafood are typically well below the concentrations used in this study.

"We had to get to the higher concentrations to see an effect," says Cerniglia. "And that's not a typical concentration that would be found in a residue analysis of seafood." Hence, although high concentrations of oil and dispersant can impact gut communities, there is no evidence to indicate shellfish harbor great enough quantities of these materials to have an effect. "It's almost like a worst case scenario, but that's the kind of information one needs to know in the beginning," so that scientists can eventually discern what safe levels of exposure to oil-dispersants mixtures might be.

Moving forward, Cerniglia says his group would like to expand the preliminary study to include samples from a greater number and variety of volunteers. "The microbiota of each individual is unique. We provided information with the three individuals' fecal samples that we used, but we'd like to expand that," Cerniglia says.

Provided by American Society for Microbiology

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