Member Spotlight

Looking for signs of lasting toxicity after Gulf oil spill

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Chemical dispersants were sprayed on the oil in the Gulf to break down the oil into smaller droplets, which are more likely to dissolve into the water. However, there is an absence of information on the effects of dispersants in the deepwater environment. AAAS member John Pierce Wise Sr. is now looking into those effects. (Photo: National Commission on the Deepwater Horizon Oil Spill and Offshore Drilling)

On April 20, 2010, the Deepwater Horizon oil rig exploded, spilling approximately 200 million gallons of crude oil into the Gulf of Mexico. By the time the well was capped 87 days later, the disaster had become the largest environmental oil crisis in U.S. history.

In order to reduce the disaster's impact on inshore waters and beaches, at least 2 million gallons of chemical dispersants were sprayed on top of the oil. The strategy may have helped stem the tide of oil to coastal areas, but the toxicity of the dispersant-oil mixture is not well understood. The long-term effects of these chemicals on wildlife in offshore areas, where the spill occurred, are still unknown.

AAAS member John Pierce Wise Sr., a professor of toxicology and molecular epidemiology at the University of Southern Maine, will present some of the first data evaluating the impact of the disaster on whales in the Gulf at the 2013 AAAS Annual Meeting in Boston. The symposium he organized, 'The Toxicological Impact of the Gulf of Mexico Oil Spill on Human and Wildlife Health', will be held on the morning of Saturday, February 16.

AAASMC spoke to Wise about the work he's doing as part of The Gulf of Mexico Offshore Toxicology Study and what attendees can expect to hear at his presentation.

AAASMC: What were the reasons behind the decision to administer chemical dispersants to the oil after the 2010 Gulf of Mexico oil spill? Did they achieve the desired effect?
Professor of toxicology and molecular epidemiology John Pierce Wise Sr.: The major concern was to lessen the amount of oil reaching inshore waters and beaches. Cosmetically, it did achieve this effect. The large amounts of oil that were accumulating on the shore decreased dramatically and rapidly. Public and political pressure dropped and a sense that the crisis was

over emerged. However, it is unclear from a scientific point of view how effective this strategy was. Visible oil still washes onto shore. It is also quite likely, though very understudied, that dispersed oil, invisible by eye, still reached the shore.

The use of chemical dispersants also resulted in the accumulation of oil into the water column and onto the ocean floor. The toxicity of these materials is unknown, as is their effect on offshore species.

AAASMC: What possible toxins are present in the chemical dispersants and the spilled oil, and where have they spread?
Wise: The major classes of toxic ingredients present that are longer term concerns are polycyclic aromatic hydrocarbons, surfactants and metals (including genotoxic metals such as chromium and nickel). These were all either in the oil or applied to the oil via the dispersants, so they would be where the oil spill occurred, which was mostly offshore. But a lot of oil reached shore, so these toxic materials would be there, as well. We are still learning where the dispersants spread these agents, so it's unclear and difficult to determine exactly how far they reached.

AAASMC: What is the purpose of your Gulf of Mexico Offshore Toxicology Study? Why are you using whales as a representative species?
Wise: This is a multiyear study to evaluate the impacts of chemical dispersants, crude oil, dispersed oil, and metals on marine life, ocean ecosystems, and human health. We hope to collect data and learn lessons from this crisis that will help us evaluate the use chemical dispersants in oil spills, and inform us on how to improve conditions in the Gulf of Mexico as well as how to protect other gulfs from this sort of disaster.

The major location of this crisis was offshore, right where the two resident species of whales live in the Gulf. One is a population of sperm whales who live, eat, and play right near the epicenter of the crisis and number about 1600 whales. The other is a group of Bryde's whales who are found closer to shore and only number about 16 whales in the Gulf. We focus on whales because they are key species in the ecosystem and they integrate all routes of exposure. Also, because they are mammals, they best reflect the possible human health implications of toxic exposure.

AAASMC: What kind of data are you collecting, and how are you collecting it?
Wise: We collect skin biopsies from the whales and grow cell lines from the biopsies. We will measure the levels of chemical dispersants, petroleum products, and metals in the biopsies and use the cell lines to evaluate the level of DNA damage. We also collect environmental samples (including water, air, representative fish, crabs, and Sargasso weed among others). We work off a research vessel that is a sailboat.

AAASMC: Can you say a little bit about your initial results? What will your AAAS presentation focus on?
Wise: Our initial focus has been on metals, especially metals known to be in oil that can damage DNA. We are finding some very high metal levels and have confirmed they are in the oil. The data we collected this first year will serve as a baseline, so we can see over time if conditions

improve or worsen. When complete, these data will provide insight into the toxic effects of these agents in offshore waters.

Related Links:

- The Wise Laboratory of Environmental and Genetic Toxicology
- AAAS 2013 Annual Meeting abstract: The Gulf of Mexico Offshore Toxicology Study
- Lessons learned from Deepwater Horizon

- **AAASMC 2013 Annual Meeting coverage**
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