A less toxic, more efficient dispersant is scientist's goal

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After the failure of the Deepwater Horizon oil well last spring, nearly 2 million gallons of dispersant were released into the Gulf of Mexico to contain the spill. While preliminary reports suggest that it successfully dispersed much of the oil, the long-term effect of such a massive volume of dispersant on ecosystems, wildlife and humans remains to be seen.

That's why a University at Buffalo researcher with expertise in how the main ingredients of dispersants -- polymers and surfactants -- interact in solutions and at surfaces is working toward designing more environmentally friendly oil dispersants, including those based on natural, mineral-based ingredients.

Marina Tsianou, PhD, assistant professor of chemical and biological engineering in the UB School of Engineering and Applied Sciences, is conducting the research under a recently awarded RAPID Response Research Grant from the National Science Foundation.

On Sept. 22, she will meet with scientists doing similar work at an NSF-sponsored "Workshop on the Science and Technology of Dispersants Relevant to Deep Sea Floor Oil Releases" in Arlington, Va.

"The purpose of our grant is to create novel dispersants through the utilization of polymers, surfactants and solvents that would be less harsh to the environment," says Tsianou.

Her goal is to develop new dispersants through a better understanding of

how they interact with crude oil and naturally occurring particles at the nanoscale level.

"There is very little published research on the fundamental interactions between crude oil and dispersant," says Tsianou.

Tsianou notes that the scientific community was aware of the need for additional research on dispersants as far back as 2005 when the National Academy of Sciences reported that research on dispersants, especially on the molecular level, was very limited and on the decline.

"That is where our research fits in," she says.

Tsianou and her colleagues at UB will be relying on their expertise on using macromolecules, nanoparticles and inorganic molecules as building blocks for high-end, multifunctional materials and products that ultimately improve the quality of life.

"When we study these surface interactions, we can learn how to control hydrophilicity and hydrophobicity -- their affinity, or lack of affinity, for crude oil -- as well as develop novel mechanisms to optimize their properties," she says.

Tsianou will explore the suitability of alternative solvents and surfactants, such as those found in processed foods, for some dispersant formulations, as well as mineral particles that could serve as environmentally friendly surface active agents.

"We also will take into consideration the different compositions that oil has, depending on its origin and the time elapsed since its release," she says. "Oil that comes from Alaska has a different composition than oil drilled from the Gulf of Mexico or the Middle East."

She and her UB colleagues will look at how mechanical disturbances, such as those caused by hurricanes and storms, affect the way that dispersant interacts with oil.

They also will study how local environmental conditions, such as those on the Great Lakes where, she points out, smaller-scale spills also occur, might influence how dispersants function and the long-term impact they might have on local wildlife and shorelines.

"If we make a more efficient dispersant, then we can use far less of it," she says. "Millions of gallons of anything, even a very benign material, is a lot to release into the environment."

Provided by University at Buffalo