biological view

A BIOLOGICAL VIEW

Work in the laboratories of MUSC researchers Louis J. Guillette, Demetri Spyropoulos, Satomi Kohno and John Baatz gets down to the stem cell level. The major focus is to determine if exposure to crude oil – specifically the mixture represented by the *Deepwater Horizon (DWH)* oil spill – affects long-term human health. The other critical question, just as in the mesocosm, is does the dispersant used on the spill to break down the oil also have detrimental health effects. In other words, is our 'cure' causing more harm?

Spyropoulos said diluted mixtures of substances might be just as potent as more concentrated single components of those mixtures, suggesting that single-component testing may be misleading as far as determining safe levels of exposures.

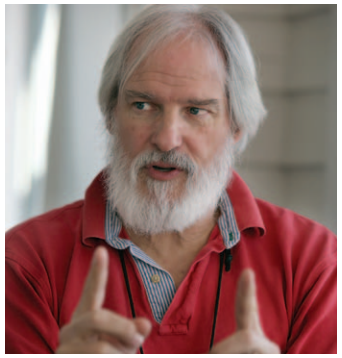
"Dispersant was deemed non-toxic at low, "working" dilutions. It's been sold as something that allows for easier breakdown of crude oil by microorganisms, but it also makes oil components more bioavailable to people and aquatic organisms, including seafood. So crude oil components or the detergent- and solvent-type components of dispersant, may not be toxic individually, but combined, impact long-term health. We're trying to find out how that works, and we're now trying to break apart the dispersant into its components and test new combinations of components."

If you want to really see Spyropoulos light up, bring up how the researchers are doing just that. "We take adult cells and make stem cells out of them. The stem cells are seen as surrogates for fetal growth. We have whale, dolphin, alligator and human cells. We've focused on human health, but we need to know how these other top, trophic predators are faring as well, partly because we share common food sources with shared exposure histories."

Guillette said the problem with long-term studies or even large-scale studies based on epidemiological approaches in such a large area as was affected in the Gulf is the complexity of sorting out one factor – the oil spill – versus so many other factors affecting human health, such as smoking, diet and stress.

"We decided to use the power of in vitro systems and either stem cells or 'engineered cells' to approach the question of potential detrimental health effects."

Demetri Spyropoulos, Ph.D.



Louis J. Guillette, Ph.D.

The lab groups of Guillette, Spyropoulos, Kohno and Baatz have extensive experience working with engineered cells and using them to examine environmental factors. In this case, they are culturing engineered cells from humans and other organisms to determine if exposure to oil changes the fate of the cell. "That is, can we change a cell's fate by exposure to crude oil or dispersant or a mixture of components of the two?" Guillette said.

"In our case, we are finding exposure to crude oil alters development so that stem cells are more likely to become fat cells versus bone or connective tissue. This has serious implications as the fate of these cells is critical for future embryonic health, and more fat cells lead to obesity."

Guillette joined forces with Spyropoulos in pathology and lab medicine, Kohno in obstetrics and gynecology, and Baatz in pediatrics. Together they outlined a way they could test oil and oil components on surrogates for developing embryos without manipulating the embryos. The researchers are using an 'engineered cell' system that's exciting in two ways, he said. It spares research animals' lives, for one, given how the technology works, and it provides a high-end biotechnology model that can be used to test hundreds of substances to determine potency of suspected environmental contaminants, he said.

"We suspected that, like in a lot of environmental health studies, the developing embryo is a major target because it's at a sensitive stage of development. We can't expose human embryos –before we even get to exposing other kinds of embryos, we thought, there's a mechanism that we can actually start to use, kind of this high-end biotechnology that we have to try and assess what's going on. More importantly, because we also have NIST here and their principal chemists involved with analytical chemistry, we could marry this kind of world-class analytical chemistry with our biology."

It's been a formula for success in how the research is developing.