US EPA's Oil Spill Dispersant Screening Results

RAPID TESTING FOR POTENTIAL ENDOCRINE RELATED ACTIVITY & CYTOTOXICITY

The US Environmental Protection Agency and the U.S. Coast Guard have authorized BP to use oil spill dispersants as one tool in the response to the Deepwater Horizon oil spill. Preliminary testing results indicate that underwater use of dispersants is effective at reducing the amount of oil reaching the surface and allows the use of less dispersant than is needed once the oil reaches the surface. However because of the unprecedented volume of dispersants being used on the BP oil spill, there are questions about the potential hazard of the dispersants that have been used or are being considered for use.

To address these questions, EPA used innovative research nationwide to conduct numerous rounds of tests to compare eight of the 14 commercially available oil spill dispersants for their relative potential to be harmful to the health of people and to aquatic species living in the Gulf. The first round of testing used fast, automated screening tests from EPA's Toxicity Forecaster (ToxCast), and the Tox21 federal partnership with the NIH Chemical Genomics Center, to compare each dispersant's potential for endocrine activity and relative toxicity to living cells. The ToxCast/Tox21 screening results have been published in the journal *Environmental Science and Technology*.

ToxCast/Tox21 screened the eight dispersants for potential endocrine activity due to the presence of the chemical nonylphenol ethoxylate (NPE) in some commercial formulations. The presence of NPE could lead to endocrine disruption and impair reproductive function and development.

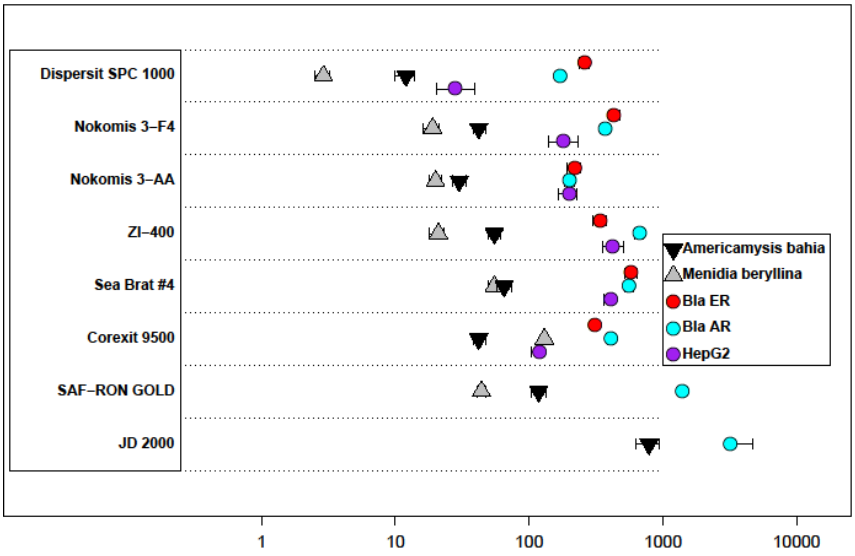

Figure 1: Toxicity data for the dispersants, combining data from 3 cell-based assays with data on aquatic species. Each horizontal band shows the data for one dispersant. Cytotoxicity values (concentration at which 50% lethality or effect is observed) are indicated by circles. Aquatic species LC50 values are indicated by triangles. Note that all dispersants were tested in all assays, and missing data points indicate that no toxicity was seen in that assay at the highest concentration tested (1000 ppm). 95% confidence intervals are shown for all assays.

EPA used over 80 rapid screening tests from the ToxCast and Tox21 programs. These included multiple estrogen receptor (ER), and androgen receptor (AR) tests for endocrine activity, and multiple tests for cytotoxicity, which is a measure of how toxic a chemical is to living cells.

A wide range of dispersant concentrations from 0.001 to 10,000 parts per million (ppm) were tested, and overall results did not indicate biologically significant estrogenic or androgenic activity for the dispersants, although weak activity was observed for two dispersants in one estrogen receptor test. Cytotoxicity was observed at concentrations above 10 parts per million for all of the dispersants.

In summary, EPA's results indicated that none of the eight dispersants tested, including the product in use in the Gulf, displayed biologically significant endocrine disrupting activity. The tested dispersants alone had relatively low potential for cytotoxicity, with JD-2000 and SAF-RON GOLD being the least cytotoxic.

These data from ToxCast and Tox21 tests were combined with additional EPA studies in the report published

June 30, 2010 entitled *Analysis of Eight Oil Spill Dispersants Using In Vitro Tests for Endocrine and Other Biological Activity*.

In progress are EPA studies on fish and shrimp to determine the relative toxicity of the oil and the dispersants to aquatic species in the Gulf of Mexico. Initial results on this testing were published June 30, 2010 in the report *Comparative Toxicity of Eight Oil Dispersant Products on Two Gulf of Mexico Aquatic Test Species*.

ToxCast is a multi-year, multi-million dollar effort that uses advanced science tools to help understand how human body processes are affected by exposure to chemicals. It currently includes 500 fast, automated chemical screening tests that have assessed over 300 environmental chemicals. The screening tests do not use animals to assess the potential toxicity of a chemical. ToxCast type tests are routinely used by the pharmaceutical industry to study the effects of drugs and by EPA to assess environmental chemicals.

Tox21is a partnership between the EPA, the NIH Chemical Genomics Center, the National Toxicology Program and the Food and Drug Administration. The Tox21 collaboration pools federal agency resources (research, funding and testing tools) to develop ways to more effectively predict how chemicals will affect human health and the environment. The goals are to screen up to 10,000 widely used environmental chemicals and drugs through a battery of non-animal based toxicity tests.

EPA's ToxCast and Tox21 screening tools are part of the Computational Toxicology Research Program (CompTox). The goal of CompTox is to provide fast, automated tests for screening and assessing chemical exposure, hazard and risk

For more information:
www.epa.gov/comptox
www.epa.gov/toxcast
www.epa.gov/BPSpill

References
Judson et al. (2010) "Analysis of Eight Oil Spill Dispersants Using Rapid, In Vitro Tests for Endocrine and Other Biological Activity" *Environmental Science and Technology* (http://pubs.acs.org/doi/abs/10.1021/es102150z)

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