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REPORT TITLE: Oil and Dispersant Toxicity Testing, Proceedings of a Workshop on Technical Specifications Held in New Orleans January 17-19, 1989

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BACKGROUND: The Minerals Management Service (MMS) conducted a Workshop entitled, "Technical Specifications for Oil and Dispersant Toxicity Testing" in New Orleans, Louisiana, January 17-19, 1989. The purpose of the Workshop was to discuss the latest information available on testing the effects of dispersants, oil, and dispersed oil on marine organisms and to recommend to MMS the oil, dispersants, and marine organisms that should be tested, as well as the methods for testing them. Because of present uncertainties regarding the effects of dispersants and dispersed oil on the marine environment, the information from this Workshop could be significant to any study proposed to synthesize existing data on the toxicity of dispersants and dispersed oil to potentially sensitive organisms in the Gulf of Mexico or to any study designed to further toxicity testing.

OBJECTIVES: (1) To recommend to the MMS methods for testing the toxicity of oil, chemically dispersed oil, and detergents to marine organisms. The organisms should represent commercial fisheries species, recreations species, sea turtles, corals, seagrasses, and mangroves. In addition, appropriate life stages for testing should be

considered. (2) to identify protocols for testing that are a) currently available, b) under development, and c) those that should be developed. (3) to comment on availability of test organisms, match species from a prepared list, and address ecological implications if possible.

DESCRIPTION: The Workshop brought together a group of experts in the fields of aquatic toxicology, marine biology and chemistry, biochemistry, transportation of oil and oil products, and modeling. Criteria for their selection were based primarily on scientific expertise as demonstrated in scientific publications and presentations at professional meetings, knowledge of organisms in the Gulf of Mexico, and knowledge of oil and dispersants. Thirteen experts spoke on subjects in discussions of papers and in formal work groups. The Workshop consisted of 1) an initial presentation of topical papers on reports by the experts, and 2) organization of participants into four working groups that considered a) selection of oils and dispersants for testing, and toxicity testing with b) invertebrates, c) vertebrates, and d) plants.

SIGNIFICANT CONCLUSIONS: Certain toxicological tests need to be conducted with dispersants, oil, and dispersed oil but they should be conducted with the knowledge that there is already an extensive toxicity database available. Test conditions should include exposures that resemble as closely as possible those expected in the field, and effect and no-effect levels should be determined.

STUDY RESULTS: A general testing scheme was developed by the participants that reflected their experiences in testing oils and dispersants. The participants developed a flow diagram to illustrate the level of testing recommended to evaluation the toxicity of dispersants, oil, and dispersed oil. The testing scheme entails aspects of fate and effects and contains basic ingredients of an aquatic risk assessment. Also, specific marine organisms were recommended for testing purposes.

The Workshop participants agreed that several tiers of testing are required in order to determine the toxicity of dispersants and dispersed oil. The first stage of the proposed testing scheme consists of screening tests. These tests can be conducted in a short period of time (6 to 96 hr), and may or may not result in determination of a concentration that kills 50% of the test population (LC50). Definitive tests, the next step, usually result in determination of an LC50 or an EC50, and effective concentration that reduces some physiological indices by half. Other tiers such as chronic toxicity tests, tests with sediments, micro/mysticisms, and field experiments were discussed. Formulations of dispersants, often a matter of proprietary nature, should be known for both for proper testing and the safety of laboratory personnel.

As a result of discussions at the Workshop, participants developed the following findings:

1. There are few "standard" toxicity test designed specifically for testing dispersants, oil, and dispersed oil. However, many standard tests found in the American Society for Testing and Materials (ASTM) standard practices

documents and other similar documents can be used if the exposure techniques are modified to accommodate oil and dispersed oil. Furthermore, some methods for testing these chemicals specifically can be found in various scientific articles and reports (relationships among recommended test species, test methods, and level of testing with reference to the flow diagram are illustrated in a table).

2. The manner in which organisms are exposed to test chemicals should be consistent, when possible, with the manner in which organisms are exposed in the natural environment. For example, contaminated sediment can be layered over clean sediment to test the impact on benthic organisms because this simulates contaminated suspended particulates settling to the bottom in the natural environment.

3. The concentration of dispersants, oil, and dispersed oil used in laboratory experiments should include concentrations found in the environment or predicated to be there, and those inducing and not inducing effects. Chemical analysis should be conducted to determine the actual concentrations and, if possible, the composition of the chemicals in the test systems.

4. Prudhoe Bay, South Louisiana, No. 2 Fuel Oil, and Saudi Arabian Light were recommended as the oils to be tested.

5. The following dispersants were recommended for testing: Corexit 9527, chemlink D609, Finasol OSR7, Cold Clean 500, Slickgone NS, and Gold Crew.

6. Models, such as the MIRG/SLR spill impact assessment model described by Trudel, should be peer reviewed, "validated," and used as another tool for predicting the impact of oil, dispersed oil, and related chemicals on the environment.

7. There is a need for micro/mesocosm studies on the fate and effects of oils and dispersants in marine ecosystems. There is also a need for testing the impact of oils and dispersants on the structure and function of ecosystems in the laboratory and in the field. However, the consensus of the Workshop was that the subject of ecosystem-level testing should be addressed in another forum.

8. Test results produced from toxicity tests such as those described at the Workshop should be integrated into a risk assessment process in order to obtain a broader view of the fate and effects of the materials involved. One approach is to integrate the results of the proposed hierarchical testing scheme with an ecological risk assessment consisting of hazard identification,

effects assessment (water column and sediment), exposure assessment, and risk characterization.

STUDY PRODUCT: Duke, T.W. and G. Petrazzuolo [eds.] 1989. Proceedings: Workshop on Technical Specifications for Oil and Dispersant Toxicity Testing, New Orleans, January 17-19, 1989. OCS Study MMS 89-0042. Prepared by Technical Resources, Inc. for U.S. Dept. of the Interior, Minerals Management Service, New Orleans, LA Contract No. 14-12-0001-30447. 140 pp.

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