

DMMP CLARIFICATION PAPER

REPORTING AMMONIA LC₅₀ DATA FOR LARVAL AND AMPHIPOD BIOASSAYS

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INTRODUCTION

Bioassays are used by the DMMP program to assess toxic and chronic sublethal effects of sediments proposed for dredging and open-water disposal. A suite of three bioassays is presently used: the 20-day juvenile infaunal growth test (with *Neanthes arenaceodentata*), the 10-day amphipod acute mortality test (with *Rhepoxynius abronius*, *Ampelisca abdita*, or *Eohaustorius estuarius*), and the sediment echinoderm or bivalve¹ larval test.

Ammonia toxicity is a potential non-treatment factor that may affect the results of the larval and amphipod bioassays (Fox 1993). A clarification for ammonia monitoring for the *Neanthes* biomass test was instituted in 1993 (Fox 1993), but there has been no guidance for the larval and amphipod bioassays beyond that found in published protocols (PSEP 1995; USEPA 1994).

Bioassays from some recent projects--particularly those from sediments with high organic fractions (such as wood waste) have shown somewhat elevated ammonia levels. Though reported ammonia levels have never reached published LC₅₀ values, there is always a possibility that relative sensitivity of the animals can vary with season, population, or other factors (PSEP 1995). This clarification is intended to provide the needed information for the DMMP agencies to assess the role of ammonia on any expressed toxicity in the larval and amphipod bioassays.

PROBLEM IDENTIFICATION

Presently, laboratories are required to report ammonia levels at test initiation and completion. Both overlying and porewater levels are measured for the amphipod bioassay, and overlying water ammonia levels for the larval bioassay. If ammonia is not a potential contaminant of concern,² aeration and/or purging are used to reduce ammonia levels when it is initially present at toxicologically important levels (EPA 1994).

Despite following appropriate protocols, there have been cases where bioassay results have still shown evidence of ammonia toxicity. Sensitivity to ammonia may also covary with toxicity of other compounds, and thus increased mortality can be an accurate measure of the toxicity of test sediments. Without direct evidence to the contrary, the agencies cannot assume that ammonia

¹ Typically, *Dendraster excentricus* is the recommended echinoderm species and *Mytilus galloprovincialis* is the recommended bivalve species for the sediment larval test. However, echinoderms *Stronglyocentrotus droebachiensis* and *S. purpuratus* or bivalve *Crassostrea gigas* may be substituted with DMMP coordination.

² In some cases, ammonia can interfere with bioassay results, providing stress to the test animals that is not related to stress caused by the chemicals of concern, (e.g. anoxic sediments with elevated TOC). In other cases, the effects of ammonia are considered important to the toxicity of the sediment, and are a contaminant of concern (e.g., wood waste).

toxicity is a primary component of any observed toxic responses if reported levels are below published levels of concern.

PROPOSED CLARIFICATION

The DMMP agencies are instituting the following clarification to guidance on larval and amphipod bioassays:

Project proponents may elect to run a water-only ammonia LC₅₀ experiment to quantify the sensitivity of the amphipod or larval population being used to ammonia levels occurring in the test sediment. Tests must be run on animals collected and delivered at the same time and place as the test animals, and be run concurrently with the bioassays. The agencies will use information from the water-only tests to consider whether ammonia is contributing to or largely responsible for the observed toxicity in a given test. Test methods and guidelines for interpreting LC₅₀ data should be arranged in consultation with the DMMP agencies prior to the initiation of any testing. Appropriate steps to reduce ammonia levels in the test sediments would still be required (see URL: <http://www.epa.gov/ostwater/library/sediment/dredgepanel.pdf> and/or http://www.wa.gov/puget_sound/Publications/protocols/protocol.html).

Ammonia LC₅₀ tests will not be appropriate for many bioassays. Elevated ammonia levels can be expected primarily from very deep sediments or those with substantial amounts of organics such as wood waste. However, ammonia LC₅₀ data will be required to support any contentions that ammonia, and not other chemicals of concern, was the primary cause of any expressed toxicity in the larval or amphipod bioassays.

REFERENCES

- Fox, David. 1993. Clarification on the *Neanthes* 20-day bioassay - requirements for ammonia/sulfides monitoring and initial weight. Presented at the 5th PSDDA Annual Review Meeting, June 1993.
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