

Introductory
Predicting the Toxicity of Metals to Aquatic Organisms:
An Introduction to the Biotic Ligand Model--
February 25, 2009
8:30 a.m. – 12:30 p.m.
EPA Region 10 Regional Office
15th Floor NPQS Conference Rooms
Park Place Building at the Freeway Park
1200 Sixth Avenue
Seattle, Washington 98101

Description:

Water quality criteria (WQC) for metals have been developed to protect the integrity of aquatic systems. However, tests used to develop WQC were performed in laboratory waters that often are not representative of natural waters. Water effect ratio (WER) tests account for the effects of substances that alter the toxicity of metals in natural waters but can be costly and time consuming.

The biotic ligand model (BLM), a computationally efficient alternative to conducting WER tests, has been developed. The BLM may assist in developing technically defensible site-specific criteria, waste load allocations, and ecological risk assessments. It is intended to promote more focused and efficient uses of resources in the regulation and control of metals and the protection of the environment. The BLM is under review by regulatory agencies and is being considered for use in refining water quality criteria in the United States and elsewhere.

This course provides an introduction, background and rationale for the BLM, a description of its applications and case examples. The course will cover special considerations, data needs and data quality objectives, and model demonstrations. Demonstrations will be brief scenarios using hypothetical data sets and will cover model navigation, data input, and model outputs.

Course Objectives:

The attendee will learn about metal toxicity, factors that alter metal acute toxicity, metal water quality criteria development, sites and modes of action of metals, metal speciation, ligands, toxicity modeling and applications of the biotic ligand model.

Course Outline:

1. Introduction (15 minutes)
 - a. Greeting
 - b. Review of course materials
 - c. Survey instructions
 - d. Introduction of instructors
 - e. Course overview
2. Assessing the Effects of Metals in the Environment (30 minutes)
 - a. Public awareness
 - b. Assessing risk
 - c. Natural sources
 - d. Analytical complexity
 - e. Speciation
 - f. Toxicity testing
 - g. History of Metal Water Quality Criteria
 - h. The model: BLM
 - i. Define: Bioavailability and Ligands
 - j. Effects of ligands
 - k. What the BLM Calculates
 - l. SAB Review
3. Background and Rationale for the BLM (60 minutes)
 - a. Introduction
 - b. Metal Water Quality Criteria
 - c. Limitation of Metal WQC
 - d. The BLM of Acute Toxicity
4. Break (15 minutes)
5. Biotic Ligand Model of Acute Toxicity: Technical Basis (60minutes)
 - a. Introduction
 - b. Description of the model
 - i. Toxicity model
 - ii. Chemical model
 - iii. WHA model (WHAM)
 - c. Relationship of Metal Accumulation to Acute Toxicity
 - d. Model Application
 - i. Effects of DOC on toxicity
 - ii. Effects of hardness on toxicity
 - iii. Effects of pH on Toxicity
 - e. Water Effect Ratio
 - f. Summary and conclusion

6. Biotic Ligand Model of Acute Toxicity: Application to Fish and *Daphnia* (30 minutes)
 - a. Introduction
 - b. Model development
 - c. Model testing: Chemical Adjustments in Synthetic and Natural Waters
 - d. Model testing: Water Effect Ratios Using Fathead Minnows
 - e. Model testing: Water Effect Ratios Using *Daphnia*
 - f. Summary and Conclusion
7. Question and Answer (30 minutes)

Instructors:

<p>Ray Arnold – Lead Instructor - Industry Vice President Environmental Sciences and Government Relations Copper Development Association Inc. 260 Madison Avenue New York, NY 10016 Phone: 212-251-7220 Fax: 212-251- 7220 rarnold@cda.copper.org</p>	<p>Bob Santore – Consulting Associate HydroQual, Inc. 4914 West Genesee St. Camillus, NY 13031 Phone: 315-484-6220 Fax: 315-484- 6221 rsantore@hydroqual.com</p>
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