Title: Algal Assay Short Course

P.I.: N. M. Ram

Objective:

To train MDWPC personnel in the theory and operation of the Printz Algal Assay:Bottle Test (AA:BT)

Procedure:

Three to five MDWPC personnel will attend a four to five day short course pertaining to the theory and performance of the AA:BT. The course will be offered three times during the three year project period and will include both lecture and laboratory sessions. Trainees will be taught to perform the AA:BT to evaluate 1) the limiting nutrient of a water, 2) the presence of algal toxicants, and 3) the sensitivity of a water to change in its nutrient status. Trainees will also be taught to use an electronic particle counter for enumerating algal cells. The AA:BT will be taught according to the EPA protocol. The course will involve the actual performance of an AA:BT under an abbreviated time period (AA:BT protocol requires 14 day incubation). The following steps will be covered in the lab:

1. sampling procedures
2. sample pretreatment (autoclaving and filtering)
3. algal culture preparation
4. test vessel preparation (chemical additions and algal innoculation)
5. cell enumeration
    a. gravimetric
    b. Coulter Counter
    c. fluorometric (time allowing)
6. data generation and analysis
7. comparison of predicted and observed algal growth.

Expected Results:

Upon completion of the course the trainees will have a full understanding of the theory and operation of the AA:BT and will be able to conduct such tests independently in a sufficiently equipped algal assay laboratory.

Cost: $21,000

1984 ?

Algal Assay Bottle Test: Short Course Outline

Day 1

8:30-9:00 Welcome, Introductions, Goals and Objectives, Review Course Outline

9:00-10:00 Nutrients and Aquatic Ecosystems - M. Switzenbaum
1. Food chains and balances
2. Nutrients and trophic status
3. Limiting nutrient theory
4. Measurements of trophic status
5. Eutrophication
6. Sources of nutrients
7. Nutrient control strategies

10:00-10:15 BREAK

10:15-11:00 Introduction to AA:BT, General Overview - K. Sheehan
1. Historical development
2. General outline
   a. Test alga
   b. Spikes
   c. Growth parameters
   d. Test conditions
   e. Data analysis and application

11:00-12:00 Overview of AA:BT Methods - R. Green
1. Sampling and sample preparation
2. Inoculum, spikes, stock culture
3. Experimental conditions
4. Experimental endpoint-growth parameters

12:00-1:00 LUNCH

1:00-1:30 Lab Orientation - K. Sheehan, K. Sellers

1:30-5:00 Lab:
1. Preparation of inoculum, ANM, stock cultures
2. Chemical additions
3. Sample preparation and dispensing
4. Microscopic examination of S. capricornutum
5. Initiation of AA:BT, experimental conditions, glassware preparation, etc.

Wednesday, August 15

8:30:9:30 Theory of AA:BT - K. Sheehan
1. Liebigs law - examples
2. Inadequacy of chemical analyses; N:P ratios
3. Specificity of AA:BT

4. Correlation to trophic status
5. AA:BT spikes and information obtained
6. MSC and growth parameters
7. Bioavailable nutrients

9:30-10:15 Analytical Methods: N, P - D. Wagner

10:15-10:30 BREAK

10:30-11:15 Sampling Methods and Preservation - M. Switzenbaum

11:15-12:00 Methods of Algal Cell Mass Determination - K. Sheehan
1. Gravimetric
2. Fluorometric
3. Spectrophotometric
4. Coulter counter

12:00-1:00 LUNCH

1:00-1:30 Lab Orientation

1:30-5:00 Lab: Coulter counter

Thursday, August 16

8:30-9:15 AA:BT Toxicity Test - P. Austin

9:15-10:00 Case Studies - K. Sheehan, P. Austin
1. Quabbin Reservoir
2. Pittsfield WWTP and Housatonic River

10:00-10:15 BREAK

10:15-11:00 Methods of AA:BT Data Analysis and Interpretation - K. Sheehan
1. MSC
2. Confidence intervals
3. Statistically significant differences in growth
4. Nutrient limitation
5. N:P
6. Bioavailable nutrients
7. Yield coefficients
8. Effects of nutrient additions

11:00-12:00 Alternative Procedures - K. Sheehan, R. Green, D. Wagner
1. Other algal species
2. Alternate P-solubilization
3. AA:BT assessment of advanced WWT

12:00-1:00 LUNCH

1:00-1:30 Lab Orientation

1:30-4:00 Lab:
1. Final Coulter counting
2. Data analysis
3. Predicted vs. observed
4. Bioavailable nutrients
5. N:P
6. Limiting nutrient analysis
7. Graphical presentations
8. Data interpretation
9. Discussion of treatment alternatives and effects of nutrient removals/additions