



ENVIRO MAIL # 004

APRIL 2012

## MICROTOX® BIOASSAY TESTING SYSTEM

### TOXICITY TESTING

Recently, several tests have been developed and standardized to assess the acute toxicity of potential water pollutants. These tests are likely to be adopted by national and international water protection laws. However, since an overwhelming amount of compounds has to be tested, it may be worthwhile to use an even simpler and more rapid test for prescreening.

The rapid Microtox® test, employing the luminescent marine bacterium *Vibrio fischeri*, is used world-wide and there is an extensive related scientific literature. Toxicity assessments using the Microtox test generally correlate well with results of more time-consuming bioassays using other aquatic organisms.

ALS Laboratory Group (M) Sdn Bhd has examined Microtox toxicity methods by using *Vibrio fischeri* markers. The toxicity tests can be used to give a screening assessment of the likelihood of contamination being present. These methods can be applied in all types of water, including surface and ground water, wastewater, drilling sump fluids and other aqueous solutions. They can also be used to assess toxicity due to water-soluble components in aqueous extracts of soil and sediment.

### METHOD INFORMATION

LEVEL OF REPORTING, EC<sub>xx</sub> (%)  
0.1-100

### METHOD REFERENCE

WCMUC 1994 (Measurement of light loss from *Vibrio fischeri*, caused by toxicity)

### TOXICITY BIOASSAY

Toxicity tests have taken on increased importance after scientists realized that many substances are toxic to living things at levels below chemical detection limits and that there are no methods to analyze for many toxic substances. The Biology Laboratory conducts an array of toxicity bioassays.

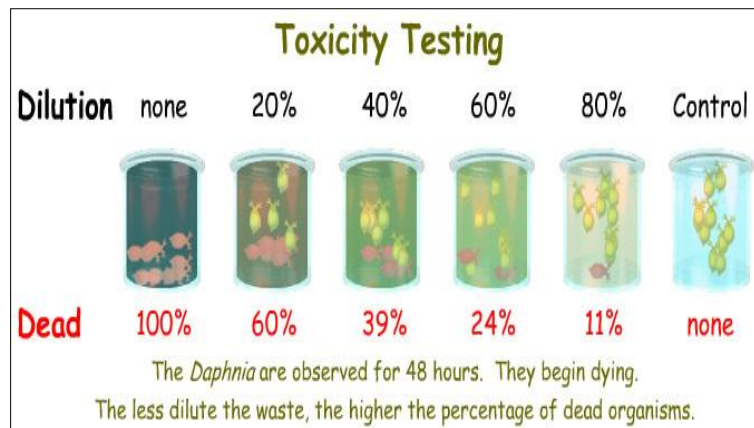
A toxicity bioassay may be run as a screening test, where the toxicity of a sample is compared to that of a control water, or as a definitive test, where several portions of the sample are diluted with varying amounts of the control water and their results compared to the control water. The screening tests indicate whether toxicity is present in the sample. The definitive tests indicate the amount of toxicity presented by the sample. Additionally, the results of a toxicity bioassay may be measured as either an acute response such as mortality or a chronic response such as growth or reproductive effects.

Applications of acute toxicity test include wastewater treatment plant pretreatment, waste stream and landfill leachate monitoring, quality control testing of raw material lots, and Toxicity Identification/Reduction Evaluations (TI/RE).



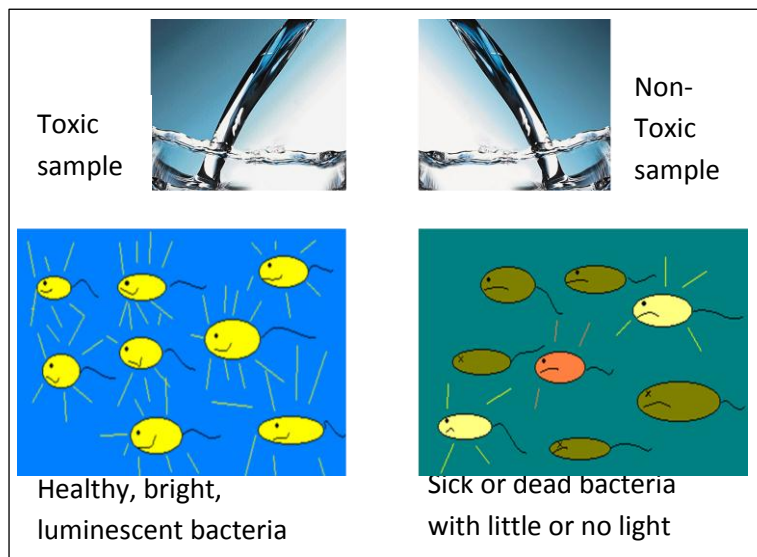
MICROTOX INSTRUMENT

## WHY USE MICROTOX OVER CONVENTIONAL TOXICITY TESTING



The conventional acute toxicity test; the fish bioassay has been used extensively to determine the toxicity of samples tested. The principle of fish bioassay lies in the exposure of the fish of selected species to the test substance preferably for a period of 96 hours. Mortalities are then recorded at 24, 48, 72 and 96 hours and the concentrations which kill 50 percent of the fish (LC<sub>50</sub>) are determined where possible.

Anyhow, there is abundance of research study debating about the sensitivity of Microtox System compared to the conventional fish bioassay. Most of the available data indicate that the more complex the sample, the higher the rate of correlation between the common test species. It also indicates that there is something fundamental about toxicity. Except for some expected variability in dose effect, none of the common test species found in the food chain tolerates toxicants as very well. The Microtox organism, *Vibrio fischeri* (*P.phosphoreum*), was selected from other bioluminescent organisms because it demonstrated the highest sensitivity across a broad range of toxicants.



By comparing the applicability of these two methods, the conventional method usually require 48 to 96 hours of testing, and take about 10 hours of actual work including the troublesome task of breeding test organisms. The method also require large volumes of the test samples. As the Microtox System procedures representative data in about 0.5 hour, this test can be considered as a primary test to quickly determine which compounds yield certain risks for the aquatic environment. In this way, the conventional bioassay could be limited to those samples which warrant further analysis.

Furthermore, the simplicity of the Microtox System procedure and the small amount of time involved make the method suitable for interactive control of all kinds of effluent.

### REFERENCES:

- Zwart D.D & Sloof W. (1983). The Microtox as an alternative assay in the acute toxicity assessment of water pollutants. National Institute for Water Supply. Aquatic Toxicology 4, 129-138.
- Lebsack M. E., Anderson A.D., DeGraeve G.M & Bergman H.L (1981). Comparison of bacterial luminescence and fish bioassay result for fossil -fuel process waters and phenolic constituents. Aquatic Toxicology and Hazard Assessment, 348-356.