



TECH NOTES

Biomonitoring

Throughout the United States, literally billions of gallons of treated wastewater re-enter our waterways from industrial and municipal water treatment plants. Unfortunately, even state-of-the-art wastewater treatment does not completely remove all chemicals and foreign materials present in the water. To protect the environment and to ensure water treatment is performed as effectively as possible, federal agencies such as the Environmental Protection Agency, state agencies, and local governments require strict monitoring of treated wastewater being released back into the environment.



Biomonitoring, or Whole Effluent Toxicity (WET)

provides critical laboratory data for industrial and municipal wastewater treatment plants that have been identified as having a reasonable potential to adversely impact the waterway where their effluent water is discharged. Biomonitoring verifies that effluent discharges into lakes, streams and rivers are within the parameters of environmental regulatory discharge permits and that the effluent does not contain toxins that can have harmful, even devastating effects on the receiving stream ecosystem.

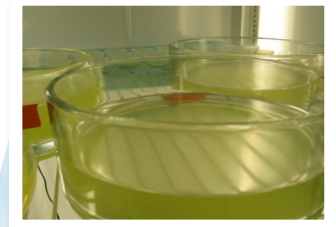
Wastewater (influent) entering treatment plants can originate from many diverse sources and contain the waste by-products of multiple industrial processes. The mixing of influent flows can result in chemical compounds that are nearly limitless in number and perhaps very toxic if released into a waterway ecosystem. While traditional analytical laboratory procedures are beneficial in screening for the presence of many chemical compounds, these procedures do not determine the toxic effects on living organisms.

Test organisms commonly used for laboratory biomonitoring tests are *Pimephales promelas* (fathead minnow), *Ceriodaphnia dubia* (water flea) and *Daphnia magna* (water flea).

These organisms are used depending on the test protocols which are divided into two classifications: acute and chronic toxicity testing. Test parameters for biomonitoring testing are normally specified in "discharge monitoring permits".

Typical permits requiring biomonitoring meet one or both of the following criteria:

1. Discharging more than one million gallons of effluent per day (classified as a major facility);
2. Wastewater discharges that have a reasonable potential to cause or contribute to water quality degradation of the receiving stream.



Acute toxicity tests measure the survival of test organisms exposed to a series of dilution concentrations of the effluent sample over a period of one to four days. By using a series of effluent dilutions, the concentration level at which the effluent becomes toxic is more easily identified. Chronic toxicity tests use sub-lethal concentrations of the effluent sample and tracks survival and growth of *Pimephales promelas* and / or survival and reproduction of *Ceriodaphnia dubia*.

Control group studies are performed in conjunction with effluent dilution studies using synthetic water. When calculating study results, measurements such as growth rate and survival percentage for the test group (effluent dilution) versus the control group (synthetic water) are compared using computerized statistical programs.

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