

# Frequently Asked Questions about MICROTOX<sup>®</sup> for Drinking Water Surveillance

## **Q: What is the Microtox System?**

**A:** Microtox toxicity testing technology is a biosensor-based measurement system for toxicity and provides an effective way to monitor for either accidental or deliberate contamination of water supplies. Microtox Test Systems are based upon the use of luminescent bacteria known as *Vibrio fischeri* which produce light as a by-product of normal metabolism. Any inhibition of normal metabolism, such as that caused by toxicity, results in a decreased rate of luminescence. The higher the level of toxicity, the greater the inhibition of light production.

The Microtox Acute Toxicity Test is being used to monitor drinking water supplies in many countries and major U.S. cities where either accidental or deliberate contamination is a concern. The Test can be completed in as little as 15 minutes, allowing for a quick response to changes in water quality.

The Microtox Test System quickly reveals any changes in the level of toxicity of drinking water. This provides for an effective means of water supply surveillance when supplies are monitored regularly at strategic points.

Microtox<sup>®</sup> Toxicity Test Systems are uniquely suited for drinking water surveillance because they provide rapid screening and confirmation results, which are cost-effective and easy to perform.

With more than 500 peer-reviewed scientific articles and more than 1,700 instruments sold worldwide, the Microtox<sup>®</sup> Toxicity Test System is the standard for rapid toxicity screening and analysis.

## **Q: Has the system been used before for drinking water surveillance during sensitive times?**

**A:** Yes. The US Army Corps of Engineers and the Washington Aqueduct system are currently using Microtox systems to monitor the drinking water that is supplied to the Pentagon to protect the civilian and military personnel working there from the terrorist threat of contaminated drinking water.

Also, during the Olympic Games in Atlanta in 1996 and in Los Angeles in 1984, in many cities during the 1991 Gulf War, and again during the Democratic National Convention in Los Angeles in 2000, Microtox systems were used for continuous surveillance of drinking water treatment and distribution systems.

**Q: What Chemicals does Microtox test for?**

**A:** Nearly 20 years of scientific studies have documented the sensitivity of Microtox to more than a thousand different simple and complex chemicals. Microtox responds to a very broad range of toxicants and classes of chemical agents including metals, pesticides, fungicides, rodenticides, chlorinated solvents, industrial chemicals, and similar materials.

**Table 1: Partial list of toxic compounds detected by Microtox Systems**

<b>Arsenic *</b>	<b>Mercury *</b>
<b>Sodium Cyanide *</b>	Selenium
<b>Potassium Cyanide *</b>	Chromium
PR-Toxin	Copper
<b>Aflatoxin *</b>	Ochratoxin
Rubratoxin	Chloroform
Ammonia	Sodium Lauryl Sulfate
Benzoyl Cyanide	<b>Lindane *</b>
DDT	Cresol
Formaldehyde	<b>Malathion *</b>
Carbaryl	<b>Flouroacetate *</b>
Trinitrotoluene (TNT)	<b>Parathion *</b>
4-phenyl Toluene	Carbofuran
Pentachlorophenol	Patulin
Paraquat	Diazinon
Cyclohexamide	<b>Cadmium *</b>
Quinine	Dieldrin
Lead	

\* Indicates specific chemical and biological threats specifically identified by name by the US Air Force in the study *“Chemical and Biological Warfare Threat: USAF Water Systems at Risk”* Major Donald Hickman, US Air Force Counterproliferation Center, September 1999.

**Q: Aren't these chemicals difficult for a terrorist to obtain?**

**A:** No. Terrorists need not be sophisticated to use these agents. Many of these compounds are commonly used, inexpensive, and easy to obtain over the counter in large quantities. Sodium cyanide is highly toxic in small doses and is easily obtainable from numerous suppliers to the mining and metals industries. It is not possible to prevent a terrorist from gaining access to these and other common compounds, but it is possible to detect if they have been introduced into a city's water system.

**Q: Why not just test for specific chemicals?**

**A:** Practical experience with wastewater pretreatment studies has shown that chemical-specific measurements identify true toxicity in unknown samples only about 20% of the time. While chemical-specific tests can be sensitive and precise, they are also very narrow and will not detect toxicants for which the analyst is not specifically looking. Unanticipated toxicants usually go undetected, because time, cost, and incomplete knowledge prevent chemical-specific testing from being a practical screen for toxicity. In addition, even when the chemical constituency of a sample is known in detail, its effective toxicity cannot reliably be calculated; different chemicals in a complex sample often work synergistically or antagonistically to increase or decrease toxicity. Chemical-specific tests are most useful for identifying particular chemicals after a sample is known to be toxic.

**Q: Will Microtox detect the presence of organisms like salmonella in drinking water samples?**

**A:** Using the portable Deltatox system with its ATP detection capabilities, an analyst can quickly determine the total ATP – Adenosine Triphosphate – in a sample. ATP is present in all bacteria and other microorganisms and serves as an efficient marker for microbial contamination of finished and source water samples. The assay is non-specific in that it will not determine the species of the organism present but it will rapidly provide an indication of contamination from microorganisms.

Using this ATP detection capability along with the toxicity detection capabilities of the system provides for a very effective rapid analytical tool for emergency response situations, allowing you to rapidly screen samples for chemical and microbial contamination.

**Q: Can Microtox provide a clear “FAIL” indication, i.e., a test saying “DON’T DRINK THIS?”**

**A:** Yes. If the light loss caused by exposure to the sample is clearly outside the range of acceptable error, the water is toxic and further testing to determine the cause is indicated.

**Q: Is the system portable?**

**A:** Yes. The Microtox Test can be performed either in a laboratory using a bench-top instrument or in the field using the portable DeltaTox instrument. The portable instrument is especially important for drinking water systems with remote drinking water sources that are difficult to guard with security forces and conventional means.

**Q: How does a drinking water system use Microtox?**

**A:** A typical application by many drinking water treatment systems across the country involves testing the water at the source, at the treatment plant, and at strategic points along the distribution system. The sampling and analysis usually occurs from once to multiple times per shift and samples are collected at numerous points such as the intake from the water source (reservoir, river, etc.), various points throughout the treatment process, before and after chlorination, and at key points in the distribution piping.