

# Breakthrough DNA Technology offers More Efficient Way to Detect Heavy Metals in Water

Protecting public health by providing safe drinking water to citizens served by community water systems is and will always be a serious concern of government agencies, public water suppliers and private industries around the world. There is a growing need to make the on-site testing of these water supplies easier and more reliable to detect and assess contamination in a timely manner to shorten the deleterious health effects of heavy metals in water. A completely new technology is now available to the pollution control industry that offers a new way to test water for contaminants that greatly reduces the time, effort, cost and complexity of testing water samples for contaminants such as lead in water. Using DNAzyme technology applied to heavy metals testing in water, ANDalyze, Inc. has developed a DNA sensor technology combined with a hand-held fluorimeter platform that tests water samples within two minutes giving results at the push of a button.

“ This new approach to testing promises to evolve testing methods for water and provide the industry with a new tool to effectively identify sources of contamination. ”



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Lead contamination as well as mercury, copper, zinc, uranium and other toxic heavy metals show up in drinking water due to a variety of reasons; some of them but not all of them being man-made. Although lead can leach into drinking water from lead solder in copper water pipes and industrial discharge contamination of water-ways, other metals such as mercury, uranium and cadmium can come from naturally occurring compounds in the soil and geology of rocks. With this in mind, we realise that the detection of lead must take place at all the end points and processing points of the water delivery system and not just at the source. Although laboratory testing methods for this purpose are very accurate and reliable they have limitations that this new technology overcomes. Lab tests create time delay, are higher cost and have more process steps than this new DNAzyme testing method. The needs of the water testing industry now require an accurate, reliable, portable and cost effective tool that can be widely deployed on-site by a range of testing professionals that include, process engineers, government agency inspectors, local water resource authority technicians, home inspectors, environmental engineers and private testing services as a front line testing method that augments proven laboratory testing methods. This new easy-to-use portable solution using DNAzyme technology meets the industries need to assess the urgent risks in our water supply on the front line.

## The core technology and how it works

One of the most important discoveries in the last decade is that DNA/RNA are not only materials for genetic information storage and transfer, but also catalysts for a variety of biological reactions, and thus called catalytic DNA/RNA, (deoxy)ribozymes, or DNA/RNAzymes. Because metal ions play essential roles in the structure and function of DNAzymes, the study and application of these new metalloenzymes has become a new frontier in bioinorganic chemistry. The patented technology resulting from research at the University of Illinois in the United States has been developed to a commercialise offering and consists of a proprietary fluorimeter and consumable sensor combination. The core technology resides in the one-time-use sensors. The sensors detect and measure the amount of metal ions in solution at low ppb levels (typically 1 – 2 PPB). Measuring the metal ions is done through a reaction that occurs between the metal ion and the DNAzyme when a water sample containing a target metal ion contaminant (such as lead) is introduced to a sensor specific for that contaminant. This reaction produces fluorescence (light) in direct



AND1000 Fluorimeter

correlation to the amount of metal ion present in the water sample. The amount of light is measured by a fluorimeter. The fluorimeter reading relates directly to the amount of metal contaminant in the water solution.

### A fast tool for industrial water

This type of testing technology offers industrial process engineers that are concerned with water discharge contamination levels, a quick and easy test that accurately analyses contamination of heavy metals to low part per billion levels. It enables quick in-process testing for the process engineer so that adjustments to chemistry parameters, discharge treatment controls and pre-discharge quality control testing can be made without the need to send samples for lengthy laboratory testing. Within one minute PPB levels can be accessed. Other field testing methods are either less accurate (dip stick, swabs), too lengthy or complex for the factory floor (reagent chemistry) or expensive and requiring expertise (ASV – electrochemical probes). It is not without its limitations of course. Complex water matrixes can interfere with this testing method and not all heavy metals are targets for DNAzyme technology. But the applications are nearly endless in

number across the Chemicals, Pharmaceuticals, Food & Beverages, Bio-technology, Water treatment, Mining and Metals industries.

### Going beyond tap water and heavy metals

The initial application of DNAzyme technology for water testing is lead, and other metals such as uranium, mercury, copper and cadmium as these are obvious contaminants that need to be addressed. But this technology and its derivatives are not limited to metal ions or even inorganic materials. The science is progressing to enable contaminants such as organic compounds and biological contaminants to be detected by this technology using the same product platform. This new approach to testing promises to evolve testing methods for water and provide the industry with a new tool to effectively identify sources of contamination.

We all want access to drinking water that meets acceptable drinking water standards. Science and engineering are meeting that challenge by providing industry with a tool that speeds the process, dramatically reduces the cost per test, and simplifies the steps needed to assure that the world's water supplies are safe for drinking and free of harmful contaminants.



*ANDalyze Uranium100 Sensor (DNA material is inside the sensor)*

**ANDalyze** has designed and manufactured a modernised hand held fluorimeter which, in combination with the DNAzyme sensors can quickly measure water contaminants at the sample site, greatly reducing the time and effort required by current technologies.