National Institutes of Health
Turning Discovery Into Health

DNA Sensors Bring Rapid Toxic Water Analysis to the Field

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Heavy metal ions in the environment like lead, uranium, cadmium, and mercury can harm the brain or kidneys, lead to cancer, and impair brain development in children. To limit exposure to harmful levels of these toxic metals, ANDalyze, Inc., formerly known as Dzymetech, Inc., developed a "catalytic biosensor" with Phase I Small Business Technology Transfer (STTR) funding from the National Institute of Environmental Health Sciences (NIEHS).

Since that first award, ANDalyze in Champaign, Illinois, has received more than $2 million in Small Business Innovation Research (SBIR) and STTR grants from NIEHS and the National Institute of General Medical Sciences to develop its biosensors. Inspectors, clinicians, and first responders use the company's portable products to measure levels of heavy metals and assess any threats to public health.

ANDalyze uses DNA strands to detect heavy metals in water. Its hand-held fluorimeter device can produce accurate results on-site in minutes instead of transporting samples to the lab for analysis. So far, ANDalyze has made DNA-based sensors, called DNAzymes, for some of the most common heavy metal contaminants: lead, uranium, copper, mercury, zinc, and cadmium.

Two relatively small complementary DNA segments are bound together and used in ANDalyze sensors. A fluorescing molecule called a fluorophore is attached to one sequence, and a "quencher" molecule is attached to the other. While the DNA is whole, the quencher molecule keeps the fluorophore molecule from fluorescing. When the segment encounters its specific target contaminant, like lead, the DNA strand breaks apart—the fluorescing molecule, separated from the quencher, can now be excited, producing an emission at a specific wavelength. Then, the ANDalyze fluorimeter detects the signal and reports the level of the contaminant.

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ANDalyze
Champaign, IL

State-District
IL - 13

Technology
Research Tool

Primary Institute
Environmental Health (NIEHS)

Project Details from NIH RePORTER
ANDalyze

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ANDalyze's device was used during the lead contamination crisis in Flint, Michigan, to determine lead levels in local school water supplies. Other schools use it to test for lead in their drinking fountains and pipes, too. "It's just a very simple, quick, inexpensive process," says Steven Naylor, Vice President of Product Management at ANDalyze. "It's a great thing to be able to help the people who really need it."

Second image of an Andalyze deviceTOver the last 10 years, ANDalyze has sold more than 300 fluorimeters and 60,000 sensors worldwide. The company is currently working on an E. coli sensor. Typical tests for E. coli in wells and other important water sources can take 24 to 48 hours; ANDalyze's method produces results in fewer than eight hours. The DNAzyme technology could also be used to detect viruses, Naylor says. "Theoretically, we could be measuring COVID-19 in the near future if we needed to."

ANDalyze is making a positive impact on public health thanks to NIH's early support. "The NIH grants that we received were critical in the development of the company," says Naylor. "Without the NIH, this company would have taken a lot longer to commercialize or might not have existed at all."