AGILENT CASE STUDY: EMPOWERING RESEARCHERS

IT'S ELEMENTARY
AGILENT HELPS RESEARCHER INVESTIGATE MYSTERIES SURROUNDING ARSENIC

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Brian Jackson is doing research at the intersection of science, policy, and public interest.

He's studying arsenic.

Long the stuff of murder mysteries, arsenic has been showing up in rice, juice, and wine.

"Ultimately, people want to know the level of arsenic in their food and is it harmful to their health," says Dr. Jackson, who directs a facility dedicated to trace metal analysis at Dartmouth College.

It's a difficult question to answer.

Jackson, who is also investigating the presence of mercury, selenium, and other metals in both environmental and biological samples, says the concentrations of these elements in the food supply are not usually very high, which is somewhat reassuring from a public health perspective, but it does present a scientific challenge.

"As analysts we are always pushing the envelope to try to measure lower and lower concentrations and still have certainty that the concentrations we generate are rigorous and accurate," he says.

That's important because even a little may be too much.

Fortunately, Jackson's lab is equipped with some highly sensitive instruments from Agilent, and he has collaborated with Agilent scientists to develop a highly effective method for determining the level of arsenic in food.

"I'm very impressed with the high sensitivity of the Agilent 8800 ICP-QQQ instrument across the elements of periodic table, but it's been especially useful for the arsenic work we do," Jackson says.

"We now measure arsenic by reaction cell technology, using oxygen as the reaction gas," he explains.

Using the 8800 ICP-QQQ with its unique MS/MS capability the arsenic is mass shifted to AsO at m/z 91 with almost 100% efficiency, and the background at mass 91 is far lower.

"Other common interferents for arsenic aren't mass shifted to this new mass," Jackson says, "so using the 8800 to measure arsenic is more robust, less prone to interferents, and offers lower detection limits."

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He notes that the new method delivers precise results, even in the presence of high doubly charged ions that can cause problems using conventional collision-cell ICP-QQQ.

Jackson uses an Agilent 1260 LC system as the front end and the 8800 ICP-QQQ as the analyte-specific detector.

"I've also developed a fast chromatography method, basically using a shorter chromatography column, for arsenic speciation," he says. "The method only uses 20 ul of sample but the detection limits are still quite low (less than 50 ng/l) because of the sensitivity of the new ICP-QQQ design."

Current regulations set by the U.S. Food and Drug Administration limit inorganic arsenic in apple juice to less than 10 parts per billion (though some consumer advocates want even lower limits) and legislation is being introduced to limit the levels of inorganic arsenic in rice and rice products as well.

"It seems clear that there is going to be a demand for high-throughput analysis of food for arsenic species by instrumentation with robust methodology and low detection limits," Jackson says. "I think we've demonstrated the effectiveness of 8800 ICP-QQQ for arsenic analysis, and it will be valuable tool for analytical labs doing food testing."

Jackson, who describes himself as an environmental analytical chemist, says that he is eager to take his new methods, which have dramatically shortened the analysis time for arsenic compounds, and apply them to other trace elements.

"We're going to build on that and include other chemically similar elements into the same chromatographic separation to develop multi-element methods that can be applied to assess human exposures to multiple environmentally relevant trace elements."

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