

THE SELENIUM EFFECT AGILENT AIDS FOOD RESEARCH WITH WIDE IMPLICATIONS



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Selenium is a vital mineral that can be found in soil, water, and some foods. We need trace amounts of it to help our bodies function properly. It helps us produce antioxidant enzymes—special proteins that play a role in preventing cell damage.

“What’s more, selenium has the effect of reducing the toxicity of mercury and arsenic, elements that also may show up in the foods we eat,” says Joseph Caruso, a highly regarded researcher at the University of Cincinnati, a comprehensive public research university in Ohio.

On the other hand, he notes, too much selenium can itself be toxic.

So the Caruso Group, which has been collaborating with Agilent on a number of projects since 2000, is using the company’s 8800 Triple Quadrupole ICP-MS and other instruments to study selenium in its various forms—in meat, fish, and feed stocks.

“Different selenium species have different effects, so our analytical job is: Let’s find out which ones are showing up most and how metabolism changes them,” Caruso says.

One of the new studies involves farm-raised tilapia. Researchers will measure how fish are affected by mercury, by selenium, and by both.

The central question: “When we enrich their feed with a mix of mercury and selenium compounds, will this bode well for a reduction in toxicity?”

The team is also determining where selenium accumulates and where mercury accumulates once they are metabolized. That is, how much will show up in the parts of the fish we eat and how much in the parts we discard?

“We think that may have wide implications,” Caruso says. “If you have a portion of the fish that is not typically eaten, such as the liver, and the accumulation of mercury is more prominent there, then that makes a big difference in the toxic implications.”

It could influence the way seafood is tested, he says. Instead of grinding up the whole



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fish and testing that, it might make more sense to analyze only the part people eat.

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"The more feed you give the fish, the faster they grow," Caruso points out. "The faster they grow, the faster they get to market, but more waste is produced."

There is a concern about the types of fertilizer that fish farmers may be using, especially if it comes from waste waters not adequately treated, yet desirable for the high nitrogen content.

The research under way at the University of Cincinnati will, of course, yield healthier practices.

He notes that members of the Caruso Group are working with Cincinnati Christian Academy to raise tilapia in an aquaponics system that will include plants and fish as well as some essential bacteria and follow them through life's various stages.

"The idea is you can eat the fish and you can eat the plants, probably kale, a green vegetable that's easy to grow and will help us find out a lot of things we need to know," he says.

Related Information

Selectivity and specificity of small molecule fluorescent dyes/probes used for the detection of Zn²⁺ and Ca²⁺ in cells.

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Chitta KR, Landero-Figueroa JA, Kodali P, Caruso JA, Merino EJ. *Talanta*. 2013 Sep 30;114:25-31.

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