Hunting for autism's chemical clues

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Left to right: Charmion Cruickshank and Troy Wood. Wood, an associate professor of chemistry, heads a study that could one day contribute to the development of a biological test for autism.

On her laptop computer one recent afternoon, University at Buffalo researcher Charmion Cruickshank calls up a mass spectrometry readout showing the breakdown of chemicals in the urine of a child with autism.

She has similar information for nine other children -- four with the disorder and five without -- and she has spent the past few years sifting through this puzzle of data for autism's chemical clues.

The goal of the research, led by UB chemist Troy Wood, is to pinpoint an array of molecular compounds that appear in distinct amounts in the urine of children with autism. If the team is successful, a biological test for diagnosing the disorder -- so far elusive -- could be within reach.

Such a test would provide clinicians with a more objective way of identifying autism, which is currently diagnosed by observing behavior.

"We're trying to understand, at the molecular level, how autism is occurring and manifesting itself," said Wood, an associate professor of chemistry. "A biological test for autism could assist with early diagnosis, which is critical because if you can identify children with autism early in life, the outcome is going to be better."

Pilot studies in Wood's laboratory have uncovered what may be a number of distinctive chemical traits in the urine of children with autism.

For example, compounds that appeared at depleted levels include the reduced form of glutathione -- a finding that Cruickshank, a UB PhD graduate, outlined in the dissertation she defended this May. Levels of stercobilin, another substance, also seemed abnormally low.

Deficiencies of both of these compounds are an indicator of oxidative stress, which some researchers believe plays a role in autism, Wood said.

To verify these preliminary results, which have not been published in a journal, Wood is hoping to complete a larger, validation study. Such a study would analyze 75 to 100 urine samples from children with autism, and an equal number of urine samples from children in a control group.

Besides stercobilin and reduced glutathione, Wood and his team have also identified a handful of other compounds in the urine that may be correlated with autism. He noted that for a biological test to be reliable, scientists will need to identify not just one or two compounds that are biomarkers for autism, but several.

Cruickshank, now a postdoctoral researcher at National Jewish Health in

Denver, Colo., and Zachary Fine, a former UB student who helped process urine samples in Wood's lab, said they hoped their work would eventually lead, one day, to real benefits for children with autism. Both researchers have friends who either had the disorder themselves or had family members with autism.

"The hope is to be able to eliminate some of the subjectiveness in diagnosing autism, and to get a better understanding of what's actually causing it," said Fine, who graduated in May with a bachelor of science in chemistry and is now a quality assurance analyst at Johnson & Johnson. "They're saying that more children have autism today than before, but it's not clear if that's because they're understanding the disease better, or if people are just diagnosing it more."

The research in Wood's laboratory on autism biomarkers is conducted, in part, with a Fourier transform ion cyclotron resonance mass spectrometer that was purchased in 2011 using a National Institutes of Health stimulus grant.

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