

EXPOSED! HOW EXPOSOMICS IS REVOLUTIONIZING HEALTH CARE



Dr. H. M. "Skip" Kingston

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Mass Spectrometry, Microwave, and
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Clinical Research

Howard "Skip" Kingston spends a lot of his time talking to doctors—the kind who treat patients in top hospitals around the world. He asks them about the kind of data they'd like to have in order to make truly informed and actionable decisions. Never mind whether it's currently possible.

He has a knack for inventing ways to measure things we didn't think we could measure—using Agilent instruments.

His focus for the past 10 years has been exposomics—a growing field that promises to help us understand one of the biggest threats to human health: the rapid rise of diseases that are not contagious.

Instead of being passed from person to person, many maladies—from cardiovascular diseases to cancers—can be traced to environmental factors and lifestyle choices.

Among the methods he has developed are two improved versions of isotopic dilution mass spectrometry and a brand new field of measurement: direct speciated isotopic dissolution mass spectrometry (SIDMS). Why is speciation important? Using his patented method, along with an Agilent mass spectrometer, Kingston has been able to accurately measure toxins in popular prenatal vitamins that were not measured or listed on the label. One example is the species of chromium called hexavalent chromium, which is a carcinogen, a teratogen, and a mutagen.

Another focus of his research: autism. "It is not solely a genetic disease," Kingston says. "It is an environmental disease with related genetic factors—and we can prevent it."

If it were purely genetic, we wouldn't see cases where one child is autistic and her identical twin is not. "Something in the environment triggers it," Kingston says.

That's why he is passionate about exposomics, which seeks to combine data about genetic variations and environmental exposures to present a holistic picture and define the underlying mechanisms of disease.

Exposure to chemicals is one factor. But it's much more than that. It's what we choose to eat and drink, where and how we live, even the kind of work we do.

Early successes include the work of Kingston's friend, Dr. David Berger, a pediatrician in Tampa, Florida, who so far has helped nearly 600 mothers of autistic children beat the odds (20 percent) that their next child would also be autistic. How? By carefully controlling the diet and environment of the mother and the newborn. "Not one of the siblings has become autistic," Kingston says.



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"Someday there will be 10,000 people able to make the measurements that only we can make right now. If each one of them in their lifetimes solves 10 significant problems, can you see how much further ahead we're going to be?"

Whatever the environmental triggers, he notes, the immune system becomes dysregulated: "It's like you have the soldiers to fight disease but no generals, so they don't know what to do. Your body starts attacking your food. Now you have sensitivities. You have antibodies to things that were previously good for you."

For the past 10 years, Kingston has been working with another pediatrician, Dr. Scott Faber, at the Children's Institute of Pittsburgh, where they put children with autism in a cleanroom and observed their immune systems starting to reset and recover.

"Dr. Faber has become very good at improving their condition," Kingston says. "He can help many of them, with support from excellent experiential services, to the point where they can be put back into a normal classroom, but they may still have symptoms from the brain inflammation and structural differences which occurred in utero and during their first few years of life. He is truly a gifted medical expert and my mentor on what should be measured."

Current tests for autism are based on behavioral observations: "They have tics, they can't speak, they can't look at you. Yes, we can diagnose this child. However, if we wait that long, it's often too late. The brain is already damaged. One of the goals of our research is, within the next 48 to 72 months, to develop for the NIH and FDA, with Dr. Faber, a new set of tests for a child who is about to become autistic but doesn't have brain damage yet."

Kingston happens to be severely dyslexic. As a youngster, he considered the condition a curse. Now he sees it as a gift: "I have what's called a learning disability but somehow it gives me the ability to be completely unfettered in terms of falling into the pattern traps other people fall into. I'm the creative scientist you bring unsolvable problems to. Then I walk around in a contemplative daze, pulling all the known information together for a few days, and come up with something where people say, 'How the heck did you get there?' The direct SIDMS measurement technology is based on the last mathematics degree of freedom, and I have a gift for knowing what mathematics are going to show before the equations are solved. Nobody knows how I am able to do that, either."

What he does know is that he wants to help others solve problems more easily: "We all have different skills. That's why I work with teams of people who know things I don't. Agilent is one of my teams. I use Agilent instruments because they are the best instruments, in my experience. Every single study I've published has relied on Agilent mass spectrometers. I could not do what I do without their equipment," Kingston says.

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