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The Calm Before the Storm

Researchers investigate possible link between environmental toxins and ASDs

by Natalie Gutierrez

Autism Spectrum Disorders (ASDs) affect 1 in 166 children born in the United States. The onset of ASDs occurs before the age of 3, and the condition may last throughout a person's life. Health Science Center researchers are working to find the key to the causes.

Merced, 4, sits on his mother's lap in a large room at the Barshop Jewish Community Center where he attends summer camp. "Ggggddop!" he yells, and then listens as the sound echoes from the top of the room's vaulted ceilings. He repeats it several times. He's relatively still until two large groups of children noisily file by. As the sound of their voices and footsteps and their movements intensify, Merced grimaces and then quickly flies off his perch and dashes across the room, running nonstop in circles. His mom, Theresa, darts after him and, gently catches him by the arm and carries him back.

"It's called 'elopement,'" she quickly explains about his behavior. "It's characteristic of children with autism. His brain sometimes can't process all of the activity and noise like other people can, so he tries to 'elope' from or escape it. Sometimes it's too much for him."

Although he appears perfectly normal, Merced is one of about 1 million Americans living with Autism Spectrum Disorders (ASDs). In addition to his periodic hypersensitivity to loud noises and activity, Merced is two years behind his peers in his speech and communication skills, and his mother continues to work on successfully toilet training him.

The U.S. Centers for Disease Control and Prevention (CDC) define ASDs as a group of developmental disabilities characterized by significant impairments in social interaction and communication and the presence of unusual behaviors and interests. Many people with ASDs also have unusual ways of learning, paying attention, or reacting to different sensations. The thinking and learning abilities of people with ASDs can vary from gifted to severely challenged. According to the CDC, the onset of ASDs takes place before the age of 3, and the condition may last throughout a person's life. The disorders occur in all racial, ethnic and socioeconomic groups and are four times more likely to occur in boys than girls.

The incidence of ASDs in Texas continues to rise, with rates in various Texas counties, including Bexar, being among the highest in the nation. Some of this increase can be attributed to improved diagnosis. However, other factors may be involved.

Questioning the causes

Although the direct causes of ASDs are unknown, the majority of studies focus on genetic factors. Claudia Miller, M.D., M.S., professor of environmental and occupational medicine at the Health Science Center, believes environmental factors play a much larger role in causing ASDs than most might think.

"The amount of chemicals and pesticides that humans are exposed to today has increased dramatically since World War II," Dr. Miller said. "But the potential human health effects of the vast majority of these compounds have never been studied.

Most people may never be exposed to a chemical plant explosion, a chlorine leak from a derailed tank car, a major oil spill or the drift from agricultural pesticide spraying, but all of us in today's world are exposed to chemicals that emanate from carpeting, furniture or electronic equipment, for example. These exposures may be at very low levels, but they happen consistently over long periods of time. Environmental health scientists are increasingly concerned about the adverse health effects of such low-level, chronic exposures to mixtures of chemicals that did not exist in our environment 60 years ago, and that the human body may be unable to detoxify."

Dr. Miller said she is particularly concerned about the effects of such exposures on fetuses and very young children whose brains are still developing. They could suffer from permanent physiological and neurological damage.

"Inherited differences in our ability to detoxify certain exposures place some people at increased risk," Dr. Miller said. "The problem is, that currently we are unable to predict which exposures may affect which individuals."

Dr. Miller is vice chair for community medicine and director of the Health Science Center's environmental medicine research and training programs at the Regional Academic Health Center in Harlingen and at the Laredo Campus Extension. She is board certified in allergy/immunology and internal medicine, and coauthored the highly acclaimed book "Chemical Exposures: Low Levels and High Stakes," now in its second edition.

Unparalleled investigation

In an effort to find out how much of a role environmental factors might play in causing ASDs, Dr. Miller and her colleagues have proposed a study called "Environment - Gene Interactions in Mexican Americans with Autism Spectrum Disorders: Targets for Intervention?"

The study, which would be one of the largest and most comprehensive studies of its kind in Texas and the only one in the nation to focus on the Mexican-American population with ASDs, would enroll 500 study participants with ASDs and 500 without ASDs from San Antonio, Laredo and the Lower Rio Grande Valley.

Dr. Miller hopes to gain funding from public and private sources, including the National Institutes of Health (NIH), for this study. Future research will focus on three major scientific approaches: in vitro (DNA-based), in vivo (living organism-based) and primate studies. The in vitro research will concentrate on laboratory isolation of genes that may cause some people to be more susceptible to environmental factors than others. The in vivo studies will involve inserting the isolated genes into cell cultures, bacteria and other small living organisms to determine the gene response to environmental agents. The primate models will mimic human responses to exposures, including during behavioral, cognitive and fetal brain development.

Health Science Center investigators from the departments of pediatrics, family and community medicine, biostatistics and epidemiology, and molecular medicine are partnering with geneticists from the Southwest Foundation for Biomedical Research (SFBR), environmental chemists from the Southwest Research Institute and faculty and staff at The University of Texas-Pan American (UTPA) in Edinburg. Future multidisciplinary projects also will involve researchers in obstetrics and gynecology, and in clinical laboratory sciences (toxicology) and biochemistry from the Health Science Center, as well as autism evaluation specialists from the Autism Treatment Center of San Antonio.

The Health Science Center's Village of Hope in San Antonio (founded and directed by Chris Johnson, M.D., M.Ed., clinical professor of pediatrics at the Health Science Center) and the campus of UTPA will serve as the recruitment sites. UTPA offers 8,000 square feet of ultra-modern, technologically advanced diagnostic clinic space at its facility. In San Antonio, the SFBR's Genomics Computing Center will provide one of the largest teams of statistical geneticists in the nation to analyze the data collected.

Investigators will perform and record the results of behavioral assessments, medical evaluations and environmental investigations. They will integrate data through a data coordinating center, which will, in turn, contribute information to the NIH's national database on autism. DNA extracted from blood samples that are collected will be sent to a centralized national repository where they will be available to researchers for future studies.

"We're talking about a thorough examination of all possible contributing factors, which means looking at every detail, from tracing family history, exposure history of mothers and children and evaluating genetic factors to collecting and analyzing dust samples, for example, from a study participant's home," Dr. Miller said. "We're searching for that 'perfect storm' or exact combinationof genetic and environmental

factors that might have contributed to a child's ASD. If we can find this, we may be able to forecast who could be at high risk so we can take appropriate and effective preventive measures and identify new therapeutic approaches."

Dr. Miller said the goal is to create an Autism Research Center for South Texas where research, prevention and the study of new treatments would be ongoing.

Hope for the future

For Merced's mother, Theresa, an Autism Research Center in San Antonio would be the answer to her prayers.

"The incidence of ASDs continues to skyrocket, especially in this region, so a research center in the heart of Texas could finally help decrease these startling statistics," Theresa said. "And for parents like me, who have children with this disorder, a center could provide much-needed resources that we could apply immediately and that would prepare us for the future when our children become adults."

Theresa is excited about the study, which is one of the most comprehensive studies in the history of ASD research.

"In this age of misconceptions and disagreements about ASDs and their causes, it is refreshing to see such a diverse group of researchers and health care professionals finding common ground and working together to discover new approaches in the prevention and treatment of this growing problem. San Antonio is fortunate to have the Health Science Center leading this effort."

Theresa says what she hopes for the most is that Merced will be 100 percent independent as an adult. She's doing her best to weather the setbacks and to celebrate Merced's successes as she prepares him now.

In the meantime, she hopes researchers will be able to track the "perfect storm" that may have caused her son's ASD, and create a rainbow of hopeand possibilities for the future of children who have it and for parents wanting to prevent it.

"Merced will always be different and that's okay," Theresa said. "With the right resources, I know that he and other children with ASDs can live normal lives."

Autism alert

About 25 percent of children with autism will seem to have normal development until about 18 months, after which they will gradually or suddenly:

- Stop talking (if they had begun to say a few words)
- Stop waving goodbye
- Stop turning their heads when their names are called
- Withdraw into a shell and seem more distant and less interested in their surroundings

"At a year of age, if a child's 'joint attention' is lacking, which means that when his parent uses a finger to point to an object, the child does not follow with his gaze, the parents should seek professional advice. Early identification is key because joint attention can be taught, and may lead to improved language development."

-Claudia Miller, M.D., M.S.

For more information about Autism Spectrum Disorders and the early signs and symptoms, visit www.firstsigns.org, www.cdc.gov/ncbddd/autism or www.aap.org/healthtopics/autism.cfm.

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