

## Oxidative stress may play important role in autism

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was associated with a marked decrease in neuron count.

—Studies by Abha Chauhan and by Xue Ming showing higher levels of byproducts of lipid oxidation in autistic subjects, and by John Green showing elevated plasma nitrotyrosine, most likely resulting from an excess of the oxidizing free radical nitric oxide. The latter finding is consistent with research by Sadik Sogut and Thayne Sweeten showing higher levels of nitric oxide in the red cells and plasma of autistic children.

—Evidence reported by Jill James of altered metabolism of methionine, which produces the antioxidant molecule glutathione, and a report by Ved Chauhan of lower ceruloplasmin and transferrin (which protect against the oxidizing effects of copper and iron).

—Turkish studies showing that autistic individuals have reduced levels of the antioxidant enzymes glutathione peroxidase, catalase, and superoxide dismutase.

—A report by Tapan Audhya that autistic individuals exhibit low levels of antioxidant nutrients including zinc, selenium, magnesium, vitamin B12, folic acid, vitamin B3, vitamin A, vitamin C, and vitamin E. Evidence of reduced zinc levels was also reported by William Walsh and Joan Jory.

—Research by Audhya showing depressed enzyme activity (specifically, of an enzyme that helps convert vitamin B6 to its active form and another enzyme that lowers levels of the potentially toxic chemical glutamic acid), possibly as a result of oxidative stress.

—Evidence indicating a “reciprocating relationship” among oxidative stress, low energy production, and “excitotoxicity” (overstimulation of neurons, which can injure or kill them) in autism. Both brain scans and biochemical tests reveal evidence of decreased energy status in autistic children, while altered glutamate metabolism is indicative of increased excitotoxicity.

DAN! researcher Woody McGinnis, coordinator of the Oxidative Stress in Autism Study, says this evidence is consistent with data showing that many autistic individuals benefit from antioxidant therapy. “Double-blind, placebo-controlled trials demonstrate efficacy of antioxidant nutrients in improving autistic behavior,” he says. “In separate trials, high-dose vitamin C (8 grams/70kg/d) or carnosine (400mg twice daily) improved autistic behavior in children. Other studies demonstrated improvement in autistic behavior with high-dose vitamin B6 in combination with magnesium. All of these nutrients serve important antioxidant functions.” In addition, he notes, parents are reporting significant improvements in children given the antioxi-

dant reduced glutathione or the nutrient carnitine (which reduces oxidative stress by improving energy production by mitochondria.)

McGinnis says that while it will take years to fully understand the role of oxidative stress in autism, “Given the promising early results with antioxidants and the benign nature of nutritional intervention, more parents are electing to try the nutritional approach now, before their children grow much older.”

Research summarized in this article was presented at the Oxidative Stress in Autism Symposium (OSAS), June 16, 2005, sponsored by the Autism Research Institute and the New York State Institute for Basic Research in Developmental Disabilities (IBR); and at the National Conference of the Autism Society of America, July 13-16, 2005, Nashville, Tennessee (see in particular the ASA presentation, “Oxidative stress in autism: What parents should know,” by Woody McGinnis, July 15, 2005).

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## New British study confirms rise in autism

More confirmation of the autism epidemic comes from a new large-scale study by Suniti Chakrabarti and Eric Fombonne.

The researchers screened nearly 11,000 children between the ages of four and six living in a Midlands town in the UK. In this group, they identified 64 children with pervasive developmental disorders, a prevalence of 58.7 per 10,000. These data are similar to those of a study conducted by Chakrabarti and Fombonne in 2001, and indicate, the researchers say, that “the rate of pervasive developmental disorders is higher than reported 15 years ago.”

**Editor’s note: Dr. Fombonne’s findings are of particular interest, because he was one of the most vocal skeptics when we first began reporting an epidemic of autism in 1995.**

“Pervasive developmental disorders in preschool children: confirmation of high prevalence,” *American Journal of Psychiatry*, Vol. 162, No. 6, June 2005, 1133-41. Address: Eric Fombonne, Department of Psychiatry, Montreal Children’s Hospital, 4018 Ste-Catherine West, Montreal, QC H371P2, Canada, eric.fombonne@mcgill.ca.

## Unborn babies exposed to hundreds of chemicals

Babies in the womb are exposed to hundreds of dangerous chemicals, according to a new study commissioned by the Environmental Working Group (EWG).

Jane Houlihan and colleagues analyzed laboratory tests of umbilical cord blood taken from 10 babies born in August and September of 2004 in U.S. hospitals. The researchers report, “Tests revealed a total of 287 chemicals in the group. The umbilical cord blood of these 10 children, collected by Red Cross after the cord was cut, harbored pesticides, consumer product ingredients, and wastes from burning coal, gasoline, and garbage.” Of these chemicals, the researchers say, “we know that 180 cause cancer in humans or animals, 217 are toxic to the brain and nervous system, and 208 cause birth defects or abnormal development in animal tests.” Among the chemicals found in cord blood were mercury, fire retardants, and the Teflon constituent PFOA.

Houlihan et al. note, “The dangers of pre- or post-natal exposure to this complex mixture of carcinogens, developmental toxins and neurotoxins have never been studied.” Such chemicals are likely to be far more dangerous to a fetus or developing child than to an adult, they say, because children’s exposures are far greater on a pound-for-pound basis; the immature blood-brain barrier of infants allows greater exposure; children have lower levels of proteins that can bind with

toxins and remove them from the body; and babies’ systems are rapidly developing, and thus more vulnerable to damage.

“Not long ago scientists thought that the placenta shielded cord blood—and the developing baby—from most chemicals and pollutants in the environment,” the researchers say. “But now we know that at this critical time when organs, vessels, membranes and systems are knit together from single cells to finished form in a span of weeks, the umbilical cord carries not only the building blocks of life, but also a steady stream of industrial chemicals, pollutants and pesticides that cross the placenta as readily as residues from cigarettes and alcohol.”

The researchers recommend that the government take stronger steps to protect unborn children and infants, including updating the Toxic Substances Control Act to require chemical manufacturers to “demonstrate affirmatively that the chemicals they sell are safe for the entire population exposed, including children in the womb.”

“Body burden—the pollution in newborns: A benchmark investigation of industrial chemicals, pollutants and pesticides in umbilical cord blood,” Jane Houlihan, Timothy Kropp, Richard Wiles, Sean Gray, and Chris Campbell, report of the Environmental Working Group, July 14, 2005. Full report available at <http://www.ewg.org/reports/bodyburden2/newsrelease.php>.