Biomedical Update:

Thimerosal: not safe!

Scientists investigating the effects of mercury have traditionally studied methylmercury, a different form of mercury than the ethylmercury used in the vaccine preservative thimerosal.Now researchers are beginning to focus specifically on ethylmercury—and the results are not reassuring..

In one recent study, Said Havarinasab and colleagues studied a strain of mice bred to be susceptible to autoimmune disorders when exposed to heavy metals. The researchers administered thimerosal to the mice for up to 30 days, and report that "thimerosal has initial immunosuppressive effects similar to those of methylmercury." In addition, they found that the mice exhibited a secondary reaction to thimerosal, involving strong immune overstimulation and autoimmunity (in which the body attacks its own cells). This secondary response, the researchers say, "is at variance with only a weak autoimmune response after methylmercury treatment."

A second study, by Damani Parran et al., investigated the effects of thimerosal exposure on developing nervous system cells and found evidence that thimerosal can significantly alter signalling by neurotrophic receptors. This signalling helps to control the differentiation and survival of cells in the nervous system.

In a third study, Thomas Burbacher and colleagues administered thimerosal shots to one group of newborn monkeys and fed another group methylmercury. The researchers found that thimerosal was cleared from the monkey's systems much faster than methylmercury, and that "brain concentrations of total mercury were significantly lower by about three-fold for the thimerosal-exposed infants when compared to the methylmercury infants."

While some media outlets interpreted this as evidence that ethylmercury is less dangerous than methylmercury, the consumer group SafeMinds says the study results actually indicate that ethylmercury is far *more* harmful. Burbacher et al.'s data, SafeMinds notes, show that the ethylmercury in thimerosal quickly crosses the blood-brain barrier where it converts to a form of mercury that cannot leave the brain. As a result, compared to methylmercury exposure, ethylmercury exposure results in twice as much mercury being trapped in the brain.

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"Immunosuppressive and autoimmune effects of thimerosal in mice," S. Havarinasab, B. Häggqvist, E. Björn, K. M. Pollard, and P. Hultman, *Toxicology and Applied Pharmacology*, Vol. 204, No. 2, April 15, 2005, 109-21. Address: P. Hultman, Division Mol. Immunol. Pathology (AIR), University Hospital, S-581 85 Linkoping, Sweden, perhu@imk.liu.se.

—and—

"Effects of thimerosal on NGF signal transduction and cell death in neuroblastoma cells," Damani Parran, Angela Barker, and Marion Ehrich, *Toxicological Sciences*, April 20, 2005, epub before print publication. Address: Marion Ehrich, Virginia-Maryland Regional College of Veterinary Medicine, Laboratory for Neurotoxicity Studies, Virginia Tech, 1 Duckpond Drive, Blacksburg, VA 24061-0442, marion@vt.edu.

—and—

"Comparison of blood and brain mercury levels in infant monkeys exposed to methylmercury or vaccines containing thimerosal," Thomas Burbacher, Danny Shen, Noelle Liberato, Kimberly Grant, Elsa Cernichiari, and Thomas Clarkson, *Environmental Health Perspectives*, April 21, 2005, epub ahead of print publication.

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"New study shows vaccine mercury results in more than twice as much mercury being trapped in the brain," news release, SafeMinds, April 21, 2005.

Abnormal immune responses detected in autistic children

Autistic children exhibit very different immune system responses than children without autism, according to new research.

Judy Van de Water and Paul Ashwood isolated immune cells from blood samples of 30 autistic children and 26 controls, all between the ages of two and five. They then exposed the immune cells to various agents that typically provoke a response by T cells, B cells, and macrophages.

When exposed to bacteria, the immune cells from autistic children produced lower levels of cytokines—which function as mediators of immune responses—than did the cells of controls. In response to a toxic plant chemical called PHA, autistic children produced higher levels of some cytokines and lower levels of others.

The researchers note that cytokines affect mood and behavior, and say that their findings contribute to research into "how changes in immune system response may make some children more susceptible to the harmful effects of environmental agents."

Ashwood says, "We would like to take these findings and explore whether, for example, the cytokine differences are specific to certain subsets of patients with autism, such as those with early onset, or those who exhibit signs of autism later during development."

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The findings of Van de Water and Ashwood were presented at the Fourth International Meeting for Autism Research (IMFAR) in May 2005. See "Children with autism have distinctly different immune system reactions compared to typical children," news release, UC Davis M.I.N.D. Institute, May 5, 2005.

Cannabinoids involved in early development

Marijuana-like chemicals are present in the brain beginning in early stages of gestation and appear to play a key role in development, according to researcher Ester Fride.

Animal studies, Fride says, show that these substances, called "endocannabinoids," aid in embryo implantation, neural development, neuroprotection, suckling response, and the development of memory and oral-motor skills. Also, she notes, one form of cannabinoid is present in human milk. Evidence indicates, she says, that the endocannabinoid system may play an important role in the development of the nigrostriatal pathway and the prefrontal cortex, and that impairment of the endocannabinoid system may be one cause of failure to thrive in infancy.

Fride notes that cannabinoid CB1 receptors develop only gradually after birth, "which correlates with an insensitivity to the psychoactive effects of cannabinoid treatment in the young organism." Thus, she says, medical marijuana may be useful in the treatment of a variety of pediatric medical disorders. In separate research, she and her colleagues tested a series of cannabis derivatives and report that several have antidiarrheal, anti-inflammatory and analgesic properties, without causing psychoactive effects.

Editor's note: For a discussion of the pros and cons of medical marijuana, readers are referred to my editorial in ARRI 17/1, the response by Darold Treffert in 17/2, and parents' letters in 17/3. Also, a new book by Debbie Jeffries, entitled* Jeffrey's Journey, *describes a mother's success in using medical marijuana to treat her son. The boy, who had uncontrollable hyperactivity and violent and obsessive-compulsive behaviors, was institutionalized three times and given multiple psychotropic drugs before his mother tried medicinal marijuana, which resulted in dramatic behavioral improvement. Jeffries was forced to stop giving her son the drug because of government intervention, and as a result, her son's uncontrollable behavior has returned.

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"The endocannabinoid-CB receptor system: importance for development and in pediatric disease," E. Fride, *Neuroendocrinology Letters*, Vol. 25, No. 1-2, 2004, cited in "Pot Pediatrics," Paul Armentano, *AlterNet*, March 15, 2005.

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"(+)-cannabidiol analogues which bind cannabinoid receptors but exert peripheral activity only," E. Fride, C. Feigin, D. E. Ponde, A. Breuer, L. Hanus, N. Arshavsky, and R. Mechoulam, *European Journal of Pharmacology*, Vol. 506, No. 2, 2004, 179-88. Address: Ester Fride, Department of Behavioral Sciences, College of Judea and Samaria, Ariel 44837, Israel, fride@research.yosh.ac.il.