# November 2007 Meeting: Dr. Gary Overturf on "The Issue of Thimerosal in Vaccine: The Science and the Hysteria"

Dr. Gary Overturf is a professor of Pediatrics and Pathology at the University of New Mexico's School of Medicine. He spoke about the hysteria that has developed in some circles regarding the alleged causation of autism by mercury-based disinfectants in vaccines at NMSR's November 14th meeting.

Gary mentioned a creationist he got in an argument with over 50 years ago, in Deming, NM. "People who want to believe, will," he said. He added that the same thing is happening with today's autism/vaccine scares, and warned that some 50,000 potential lawsuits may actually end up destroying many vital health programs. Vaccinations are the Number 1 medical success story of the 20th century, he said. In the United States in the early 20th century, there were almost 200 thousand cases of diphtheria annually. In 2001, however, the number of cases in that year numbered just two. Similar successes have been obtained for smallpox, pertussis, tetanus, measles, mumps and many more diseases.

Dr. Overturf then turned to toxins in the environment. "Everything, organic and non-organic, is potentially toxic! Even water or bovine milk are toxic enough and lethal if given in high enough dose," he said. Besides dose of toxins, other key factors include variations in animal or plant species, available metabolic pathways, and the duration and routes of exposure. Mercury, for example, can be absorbed into the body by inhalation, ingestion, skin contact, via intravenous treatments, or by injections. By far the most important consideration, he said, was "Dose, Dose, Dose!!!" Toxicity is most directly related to the dose of the toxin.

Mercury can be found in both inorganic and organic forms, he said. Inorganic mercury occurs in elemental or metallic forms, or as mercurous or mercuric salts, whereas organic mercury occurs in carbon-bonded compounds such as ethyl and methyl mercury. At high doses, mercury and mercuric compounds are well established nephro-toxins (affecting kidneys) and neuro-toxins (affecting the nervous system). He said that neurodevelopmental effects have been demonstrated at low doses, but only for pre-natal exposures, not for post-natal exposures. It's difficult to perform controlled mercury-exposure experiments on humans, because we know it's indeed toxic at high doses. If metabolized, both

forms of organic mercury (ethyl and methyl) affect the kidneys, whereas direct exposure to organic mercury has the most effect on the central nervous system. Mercury can inhibit protein synthesis, which is why it's a problem in kidneys.

Thimerosal, a thiosalicylate salt of ethyl mercury, is used as a disinfectant on some vaccines. It is about 50% mercury by weight, but is added to vaccines in concentrations of just 0.003% to 0.01%. An average dose of mercury as a preservative in vaccines is around 17 µg (micrograms, millionths of a gram), about as much mercury as is found in a 5 to 6-ounce can of tuna. In cases where mercury treatments on bread and rice did cause severe health problems, the exposures are on the order of 2 to 3 milligrams (thousandths of a gram) per kilogram of body weight, or about 200 milligrams (or a fifth of a gram) for a 70-kilogram adult.

Before thimerosal was removed from infants' vaccines in 2000 because of concerns for its possible effects on infants, the typical series of vaccinations given in the first six months of an infant's life resulted in a total exposure of 100 to 200 µg of mercury. Of four agencies having requirements for exposure limits, three allowed this much, with room to spare (the Agency for Toxic Substances and Disease Registry, ATSDR, under Health and Human Services (HHS) and the Center for Disease Control (CDC); the Food and Drug Administration (FDA); and the World Health Organization (WHO). While these organizations were worried about infant 6-month exposures to over 300 or 400 µg of mercury, only the Environmental Protection Agency (EPA) had a guideline of under 200 µg, specifically 106 µg. *Because of EPA's concerns, thimerosal was eliminated from infant vaccines in 1999.*

Something else has changed in the last few decades, and that was the very definition of autism itself. The old diagnosis of autism was expanded to include several disorders, now collectively called Autism Spectrum Disorders (ASD). There is considerable overlap between ASD and retardation; for example, Fragile X syndrome, normally the most common cause of mental retardation, is now found to also be associated with ASD. Because the definition of "autism" was expanded, the reported incidence of autism increased, and ASD is now found in about 6 individuals per thousand (or 1:166). Other diseases now associated with ASD include tuberous sclerosis, PKU, Rett syndrome, Smith-Lemili, and Opitz syndrome.

While many of the conditions related to the onset of ASD have been identified with environmental exposures to the fetus in the womb, especially in the 2nd trimester of pregnancy, no data have shown that children with ASD have increased environmental exposure to mercury. In fact, Dr. Overturf said that the incidence of autism has continued to "increase" over the last seven years, despite the removal of thimerosal in vaccines during this time interval. Only one paper, published in Lancet in 1998 by A. Wakefield et. al., supports a thimerosal/autism link, and this paper has since been retracted by the journal and all of the authors except Wakefield. Because the Wakefield study has been vigorously championed by several well-intentioned (but misguided) special interest groups, a large segment of the population (over 50% of parents surveyed) believes that thimerosal preservatives do produce autism in infants.

Several other studies have provided evidence *against* a relationship between thimerosal and ASD, including large studies in the United Kingdom (Andrews N. et. al. & Heron, J. et. al., *Pediatrics 114,*

*2004*, with 109,863 children studied over 1988 to 1997), California (JAMA 2001; 285:1183-1185), a CDC study on 124,720 infants (phase 1) and 16,717 children (phase 2 re-evaluation) (Verstraeten T., et. al., Pediatrics 112:1039, 2003). The latter study found "… *no consistent significant associations were found between thimerosal-containing vaccines and neurodevelopmental delay.*" The National Academy of Science has done three detailed studies (two in 2001, and another in 2004), again showing no linkage between thimerosal and ASD.

Professor Overturf concluded by stating that in the future, some other toxin, perhaps even one with some form of mercury, may be found to be associated with higher levels of ASD; however, many thorough studies have firmly shown that thimerosal vaccines are not responsible. The "alarming" increase in autism is not due to increased exposure to toxins in the environment, but rather to the re-definition of ASD itself.

A lively Q&A session followed. Asked about radio commercials for a Santa Fe doctor claiming to have cured autism with hyperbaric oxygen therapy, Gary said the only medical application for such therapy is for scuba-diving accidents, and that there is no "magic cure" for autism, which often is associated with genetic factors.

NMSR thanks Dr. Overturf for a splendid presentation.