



Response to the NIDCR Funded Children's Amalgam Testing publications in the JAMA 2006.*

By Boyd Haley, Ph.D. Professor of Chemistry at the University of Kentucky

Introduction: It is of considerable importance that those interested in the health of our children consider the fact that the level of mercury in blood, urine or feces may be more a factor of the ability of the child to excrete mercury than it is of total mercury exposure.

For example, research has shown that autistic children represent a subset of the population that does not effectively excrete mercury and therefore has less mercury in the excretory materials but much more in the organs of their body. Also, autistic children have been reported to have aberrant porphyrin profiles indicating they were mercury toxic from an early exposure to mercury and that these aberrant profiles returned towards normal when the children were treated with mercury chelation procedures.

The inhibition of the porphyrin synthesis pathway inhibits the production of the final product, heme. Heme is used to bind and carry oxygen in the hemoglobin of blood. Heme is also a necessary component of the P-450 enzymes that are critical for detoxifying the body of pesticides, herbicides and other organic toxins. Heme is also a critical factor for the ETS (electron transport system) of mitochondria where most of the energy (ATP) of the body is made. A report in the February issue of the Proceedings of the National Academy of Science established that heme is needed to flush beta-amyloid from the brain, if insufficient heme is present the beta-amyloid forms "large toxic clumps" called amyloid plaques, a major diagnostic hallmark of Alzheimer's disease.

These same amyloid plaques are regarded by many as the cause of Alzheimer's disease, but in reality the primary cause is toxins like mercury that prevent amyloid protein excretion. Therefore, mercury inhibition of the heme-producing porphyrin pathway could have major effects secondary to the primary site of mercury inhibition.

Previous publications by others have shown that adults exposed to dental amalgam mercury vapor have aberrant porphyrin profiles due to a genetic polymorphism (CPOX4), which significantly modifies the effect of mercury exposure on urinary

porphyrin excretion in humans. Some were more affected than the majority, indicating a genetic susceptibility of a subset of the population to mercury toxicity. This emphasizes the question as to why wasn't the porphyrin profile data published in these JAMA articles instead of being dismissed by the authors with only brief comments? It would be hard to explain how adults could be affected without seeing a similar effect in the children of these studies.

Below are some comments regarding these studies. Some relevant research publications regarding my comments are presented at the end of this summary.

1. In the first line of the Portugal based study entitled "Neurobehavioral Effects of Dental Amalgam in Children" Dr. Timothy A. DeRouen, et al., the author writes, "dental amalgam... emits small amounts of mercury vapor". This is neither a scientific nor quantitative statement, i.e. what is a small amount of mercury? The exposure level of a toxin to any such study of this type is absolutely needed and this is totally ignored in these studies making any comments on safety by measuring the urine mercury levels totally invalid. The fact is these researchers are implanting into children a material that is 50% mercury and known to emit mercury vapors, but the question is how much mercury vapor are these children exposed to daily. Both the ADA and the FDA have steadfastly refused to address this question by doing the appropriate experiments and publishing them. My opinion (since I have done this) is that they know the level of mercury vapor emission from amalgams is too high to be accepted as safe, so they stonewall this critical experiment. Now it appears as if the IRB boards of several prestigious medical schools have been convinced to do the same. It is a dereliction of duty to place a toxic material into any patient, but especially a child, and especially if the level of toxic exposure is not defined.

2. It has been published and verified that over 90% of mercury excreted by humans leaves through the biliary transport system of the liver and is excreted in the feces, not the urine. Urine mercury levels are well documented not to reflect exposure under many conditions. Therefore, a major flaw in these studies published in JAMA is that they did not measure mercury using the appropriate fecal samples and, instead, used urine, which is a minimal excretion route and vastly underestimates the total mercury exposure. Also, most mercury excreted in the urine is that bound to cysteine or other soluble, small molecule sulfur containing compounds. Therefore, the urine mercury excretion levels are as much dependent on the blood levels of cysteine or other compounds as they are on mercury exposure. Cysteine levels are dependent on diet.

The bottom line is that these studies looked for mercury in all the wrong places. One study reported that mercury in fecal materials was 13 times that in urine of the same patients. If you don't want to find data indicating excess exposure to mercury look where it isn't, look in the urine and that's what these studies did.

3. Since the IRB's of several prestigious universities approved this research, i.e.

research that exposed children to an unknown daily level of mercury vapor, the public should demand that these same universities perform experiments on the same brand of amalgams, made outside of the mouth, of known weight and surface area and determine the amount of mercury released per day by these amalgams (with and without abrasion to mimic the daily effects of chewing). They should publish these results. [*IAOMT did it*– see [article.](#)] With this data a decent estimate of the daily exposure of the children to mercury from these amalgams can be made and an approximate determination of what fraction of the amount excreted in the urine accounts for the bulk of the mercury. Studies done in my laboratory, similar to those done by others, have demonstrated that the emission of mercury vapors were much higher than what has been “estimated” by pro-amalgam individuals. Chew et al. *Clinical Preventive Dentistry* 13(3) 5-7, 1991, showed that in a study of long term dissolution of mercury from a “non-mercury releasing amalgam,” it was determined that 43.5 microgram/cm²/day Hg was released and this remained constant for 2 years. What is also known is that different amalgam preparations release mercury at vastly different levels. The modern high copper amalgams were shown to release much higher levels than other older type amalgams.

4. Look at Figure 2 on page 1788 where the authors plot the urine mercury levels at each year. Years one and two show a steady increase in urinary Hg in the amalgam bearers versus the amalgam free children as expected. Yet, on years 3 to 7 the level of mercury in the urine of the amalgam bearers continuously drop until they near the levels of the amalgam free children. The paper implies that restorative treatment was used in years 6, 7 and 8, which should increase, or at least maintain the urine mercury levels. This needed explaining. In the Chew study above the amount of mercury released was steady for 2 years (the length of the study). Consider this, plus the fact that a 1gram filling would contain 500,000 micrograms of mercury, or 100,000 days of emitting a toxic 5 micrograms per day. This equates to about 275 years of mercury before it is all gone and the average life span of an amalgam before replacement is less than 10 years. Amalgams do not stop releasing mercury vapor within 7 years. So, what caused the drop after year 2?

Urine mercury levels are, in my opinion, a measure of the amount of mercury being excreted by this route. Therefore, after two years exposure the route of kidney excretion of mercury appears to be becoming less effective. This is consistent with the well known fact that increased mercury exposure inhibits its own excretion. This data is quite damning to the idea that amalgams are safe to place in children. For example, youths die of idiopathic dilated cardiomyopathy (IDCM) while under physical stress in athletic events and it has been published that the heart tissue of these individuals contains 178,400-ng/g mercury or 22,000 times more than was found in their muscle tissue, or in the heart tissue of individuals who died of other forms of cardiac disease.

Another example, a study published in *J. Amer. Dental Assoc.* regarding amalgams and Alzheimer’s disease reported no correlations between amalgams and brain mercury levels. Yet, about 15% of the nuns in this study had brain mercury levels in the

micromolar range, a very toxic level of mercury since about 1,000 fold less than this has lethal effects on neurons in culture. Again, this reflects that certain individuals appear to have less ability to excrete mercury than others, even if they live in the same location and eat the same food, etc.

The point being, that mercury collects in certain tissues at levels much higher than have ever been found in blood, urine or hair and it is the primarily the retention of mercury (or the inability to excrete mercury) that enhances its toxicity from continuous, low level exposures. The bottom line, the data in their Figure 2 gives strong indication that after two years exposure to dental amalgam mercury, the children seem to be losing their ability to excrete mercury through the urinary pathway. The real question is, have they also lost the ability to excrete mercury through the major, fecal pathway? In contrast to the recommendations made by these authors this may be a major reason to discontinue placing amalgams in children.

5. These authors say very little about the porphyrin effects in the amalgam bearers except to state that they did not indicate kidney damage. This begs the real question, what about the children's ability to make heme? Were the porphyrin profiles aberrant, as found in adults exposed to amalgams, or in autistic children? One has to question why this data was not included and discussed in detail.

6. It is well described in the literature that mercury is a potent immune system suppressor and others have detailed experiments that show this. Why was this easy to test system ignored in these studies? Experiments have shown that mercury exposure dramatically effects macrophage phagocytosis of microbes at very low levels. To choose to check effects on IQ over this period of exposure and ignore the immune system, especially when the immune system is known to be affected immediately on mercury exposure, is questionable. Especially, when the object of the study was to determine if mercury from amalgams were "safe" for use in children.

7. One of the inclusion criteria for these studies was "no interfering health conditions," and Dr. Bellinger, one of the authors, stated these interfering conditions included autism and prior neurological disorders. The CDC reports that 1 in 6 American children have a neurodevelopmental disorder; I am unaware of the rate in Portugal. However, these papers conclude that amalgams should remain a viable clinical option in dental restorative treatment and they did not exclude use on children with neurodevelopmental disorders, the type of child they excluded from their studies. I feel that I could make a very convincing argument that the children with prior neurological disorders are children who fall into the category of children who do not effectively excrete mercury. In this way the study has a major failing in that it excluded from the population being studied those children most susceptible to mercury toxicity.

Conclusion: These studies were poorly designed and tell us one thing of good value – that children with amalgams most likely slowly lose their ability to excrete mercury after about two years of amalgam exposure. This experiment should have been done on primates, not humans and presents a question of ethics in medicine.

The major problems with the studies are that they:

1. Ignored measuring the amount of mercury exposure to children by first determining the amount of mercury emitted from an average sized amalgam outside of the mouth.
2. Used urine and blood mercury levels when 90% plus of mercury is excreted in the feces. This obviates any conclusions they make, as urine mercury levels are unreliable with regards to exposure, which is exactly what their own data shows.
3. Did not select the most sensitive clinical testing parameters for detecting mercury toxicity but instead used testing parameters that are known to fluctuate without known cause or parameters that require long-term low level exposure to show an affect.
4. Did not state that their conclusions of amalgam safety should not include children with any prior neurodevelopmental or systemic illness.
5. Ignored the drop in mercury excretion in the urine after year 2 even though the mercury exposure from amalgams remained the same or increased. This is a sure sign of losing ability to excrete mercury with increased exposure to this toxic metal.

* Timothy A. Rouen, et. Al., Neurobehavioral effects of dental amalgam in children, JAMA 295(15): 1784-92. 2006.

David C. Bellinger, et. al., Neuropsychological and renal effects of dental amalgam in children, JAMA 295(15): 1775-83. 2006

References:

1. Escheverria, D., Woods, JS et al. Chronic low-level mercury exposure, BDNF (brain derived neurotrophic factor) polymorphism, and associations with cognitive and motor function. Neurotoxicol. Teratol, 2005 Nov-Dec; 27(6) 781-96.
2. Escheverria, D. Woods, JS, et al. The association between a genetic polymorphism of coproporphyrinogen oxidase, dental mercury exposure and neurobehavioral response in humans. Neurotoxicol. Teratol. 2005 Dec 8.
3. Chew et al. Clinical Preventive Dentistry 13(3) 5-7, 1991. In a study of long term dissolution of mercury from a non-mercury releasing amalgam it was determined that 43.5 microgram/cm²/day Hg was released and this remained constant for 2 years.

4. Kingman et al. J. Dental Research 77(3) 461, 1998. In a study of 1,127 military personnel by NIH the level of mercury in the urine of amalgam bearers was 4.5 times that of amalgam free controls. Some with extensive amalgams had levels 8 times or high than the amalgam free controls.
5. Hultman, P. et al. Adverse immunological effects and autoimmunity induced by dental amalgam and alloy in mice. The FASEB Journal 8 Nov 1183-1190, 1994.
6. Wataha et al. Dental Materials 10 298-303, 1994. The amalgam material with the trade name Dispersal Alloy made solutions in which it was soaked severely cytotoxic.
7. Begerow et al. International Archives of Occupational and Environmental Health 66(3) 294, 1994. After removal of amalgams from 17 patients urine mercury levels dropped by a factor of 5.
8. Frustaci et al. J American College of Cardiology 33(6) 1578, 1999. Data showed that individuals who died with IDCM (idiopathic dilated cardiomyopathy, the cause of young athletics dying during physical stress) had 22,000 times more mercury in their heart tissues than individuals who died of other forms of heart disease. Never has there been a urine or blood level reported that comes to the level of 178,400 ng/g tissue which is the same as 178.4 micrograms/g and one milliliter water weighs 1 gram. In the study under discussion they were talking about 3-5 micrograms/liter (1,000 milliliters) or so which compares t178.400 micrograms/1000g in IDCM. Where does this mercury come from as this disease kills intercity kids as much as anyone and they are not big sea food eaters.

BIOGRAPHY 2002

Dr. Haley received his BS in Chemistry/Physics from Franklin College in 1963. After a tour in the U.S. Army he completed his M.S. in Chemistry at the University of Idaho (1966) and his Ph.D. in Chemistry/Biochemistry at Washington State University (1971). He was an NIH Postdoctoral Scholar in the Department of Physiology, Yale University Medical School from 1971 to 1974. His first academic appointment was at the University of Wyoming in 1974 where he was promoted to full professor in 1983. In 1985 he was appointed as the first scientist hired in the Markey Cancer Center at the University of Kentucky with academic appointments as professor in the College of Pharmacy and in the Department of Biochemistry of the University of Kentucky Medical Center. In 1996 he was named Professor and Chair of the

Department of Chemistry (stepped down 2006). He is also co-founder and scientific advisor of Affinity Labeling Technologies, Inc., a biotech company that synthesizes and markets to major research institutes nucleotide photoaffinity analogs for biomedical research.

In the past 14 years Dr. Haley has emphasized studies on Alzheimer's disease in his laboratory. Currently, a diagnostic test he developed for Alzheimer's disease is being promoted by clinical diagnostic laboratories (www.synxpharma.com <<http://www.synxpharma.com>>). His research in the biochemical aberrancies in Alzheimer's disease also lead to his identifying mercury toxicity as a major exacerbating factor, perhaps even a causal factor. He was one of the first to propose that the organic-mercury preservative (thimerosal) in infant vaccines was the most likely toxic agent involved in autism related disorders. In the past few years Dr. Haley has testified before numerous government agencies on the effects of mercury toxicity from dental amalgams and vaccines. This list include the Congressional Committee on Government Reform, the Pentagon to Surgeon Generals, the Institute of Medicine of the National Academy of Sciences and legislative committees of the states of Maine and New Hampshire. In the latter situation, both states enacted legislation requiring dentists to inform patients of the 50% mercury in dental amalgam fillings and the concern of many that emission of mercury from these amalgams affects personal health. He is also a member of the Autism Think Tank of the Autism Association. Dr. Haley has also been invited and presented his lectures on this subject at international conferences in England, Canada, Australia, France, Germany, New Zealand, Mexico and Denmark.