



## Well Water Heavy Metal Synergy and Impaired Child Functioning

We report the successful treatment of an 11 y/o boy with new sub-acute impairment in mood, behavior and school performance possibly due to well water heavy metal contamination.

According to his parents, teachers and relatives, the child's baseline mood was pleasant with only age-appropriate frustration. He had many interests and suffered no anhedonia or ongoing sadness. He was obedient at home and school. His I.Q. was over 130 with no learning disabilities and grades in the top fourth of his class. He had two-second degree relatives with adult onset Dysthymia.

His home water was tested yearly for six years with a basic test that did not look for heavy metals except iron. New housing nearby had well water drilling. The parents then noted a change in the water filter sediment. The water was retested with a basic test, and no major changes were noted except for an increase in iron.

Over 5-7 months, the youth's behavior changed. He was unable to focus on a task or finish homework. His mood was irritable and depressed. New oppositionality appeared most days at home and school. The child was unable to enjoy his previous pleasures and his homework. Tests and handwriting declined. He eventually punched peers and adults daily. He had trouble focusing for prolonged periods and cried inconsolably. Sleep and appetite remained at baseline. Vital signs were normal.

Two pediatricians, a family physician, two child psychologists and a child psychiatrist evaluated him. Basic lab testing was normal. He was "medically cleared" by the pediatricians who felt the youth had a psychiatric disturbance. The child psychologists diagnosed him with Attention Deficit Hyperactivity Disorder, Major Depression and Oppositional Defiant Disorder. The Child Psychiatrist agreed.

The youth was treated with a token economy program at home under a psychologist's weekly direction and treated with multiple medications by the psychiatrist. Sertraline was started at 25 mg and titrated up to 150 mg over 10 weeks months with no benefit. Other trials included fluoxetine, methylphenidate and gabapentin. These all appeared to worsen his behavior, and caused disinhibition. The behavioral treatments did not produce change despite weekly modifications. Eventually, the child developed prolonged inconsolable crying, occasionally lasting up to 45 minutes. The parent's terminated all medications and behavior treatment, and sought other opinions.

The mother purchased four hair test kits that tests essential minerals and common heavy metals (Great Smokies Diagnostic Laboratory: College of American Pathologists #31722-01 and CLIA Lic. #34D0655571). These results came back in the "excessive or

positive range" for three of the four people tested from the home. Specific metals found were mercury, arsenic, lead and cadmium.

Since as a general principle, heavy metals are dynamic and often migrate to brain, liver, kidney, fat or bone (E.g., Pathak et al., 1998; Vahter et al., 1994), we considered the hair tests only an approximate screening method and wanted further testing. The only obvious metal exposure source noted was from arsenic treated wood used in the family outdoor play area. Play in this area ceased and the wood materials removed.

We requested a new *comprehensive* water analysis and blood testing for these metals. The mother and patient were compliant. The blood testing of the child showed levels of two of the metals in the high "normal range." The boy's mother, however, showed serum mercury over twice the upper normal range. Since we are not convinced that heavy metals statically reside in blood, we considered both the high normal and excess blood level as notable. Finally, we found that the home water testing was *strongly positive* for lead, mercury, cadmium and arsenic (Doctor's Data: CLIA # 14D0646470).

The parents decided on a trial of "NDF" or "Nanocolloidal Detox Factors." NDF is an oral liquid tincture containing pulverized plant components in a tincture. They requested a trial "based on their own research." The product does not require a prescription. Since chelation agents like EDTA may not mobilize brain heavy metal optimally, have been associated with rare renal toxicity (Goyer et al., 2001), and are commonly used IV, we accepted their wishes. The child's poor frustration tolerance and disinhibition did not make IV treatment an appealing option.

The NDF liquid contains 2-3 micron diatoms of Chlorella (RBC's are about 7 microns). Chlorella is used industrially to bind heavy metals (Hammouda et al., 1995), and might have anticancer activity (Negishi et al., 1997). The diatoms are pulverized into small fractions to increase surface area and enhance membrane passage. Real-time digital EEG was used to evaluate the brain effects of pulverized Chlorella in four documented heavy metal patients, and were found to have statistical change over each patient's repeated baseline readings beginning at 20 minutes. Urine and fecal analysis correlated with heavy metal mobilization and excretion (Christman, 2001).

The child was placed on one drop per day sublingually for 5 days a month after the last medication trial. No allergic responses were noted. He was then increased slowly up to 5 drops per day in an 8 ounce glass of water over 6 days. Treatment continued for 24 weeks. Clinical changes were noted after 8 days. His unprovoked assaultiveness towards peers decreased from 4-7 incidents per day to 1-2 per week. His eccentric and unexplained crying stopped. After two weeks he was playing games he had abandoned. In three weeks he was affectionate with family and relatives. In three weeks he was considered "himself again" by his teacher and getting marks in the top 15% of the class.

The child was also rated with a psychiatric rating tool. A commonly used fast assessment measure, the Iowa Connors Teacher's Rating Scale, is occasionally used in current research (Wolraich et al., 2001). It quickly measures attention, behavior and functioning.

On this scale, the child moved from a seriously impaired 27 before treatment to a mere 9 after treatment with NDF.

An advanced home water filtration system with heavy metal removal ability was installed at 5 weeks of initiating treatment and two water tests by Doctor's Data confirmed fully acceptable ranges of all tested heavy metals, including the four previously positive. (Doctor's Data was blinded and unaware of the new filtration system).

One might suggest the child had a transient case of primary mood disorder. However, during the pretreatment interview the child had mild trouble with orienting to the evaluator's direction and appeared to have trouble connecting visually with the examiner. His cognitive processing appeared decreased in excess of any marked mood component. Also, his improvement followed the treatment very closely in time. Finally, his family history is not strong for severe mood disorders and he had no major stressors in school or family.

We offer this report to merely propose the possibility that in some children, *synergistic* heavy metal exposure and accumulation may be clinically important, even if merely in "high normal" ranges in blood testing which is commonly relied upon by traditional medicine. Specifically, could the combined presence of "normal range" serum lead, arsenic, cadmium and mercury, change the threshold of normal levels for what is psychiatrically optimal? Research on the cognitive, mood and behavioral effects of *synergistic* metal effects in psychiatry or environmental toxicology are almost non-existent. Just because such studies may be challenging to do, does not mean this problem does not occur in clinical medicine. Current data available focuses on a *single heavy metal* and its specific "safe" blood level in isolation. But heavy metals rarely exist in isolation in the body.

Further, "allowable levels" in standard blood tests may not always apply when heavy metals are possibly sequestered in tissues and *not* in sampled blood. Perhaps post mortem research could expand our knowledge by measuring critically dangerous heavy metals in key human tissues and comparing them to various body fluids.

In conclusion, a pilot series of 11 pre and post urine tests show NDF is effective and worthy of larger study. These initial samples show all patient urines had an increase in toxic heavy metals in post urines--particularly in the initial hours post ingestion. Urine collection method may be critical. Since the kidney filters the blood approximately 2.5 times per hour (Guyton et al., 2000), we hypothesize that NDF may not need the 60 blood passes per day to show chelation ability. Therefore, we collected one hour of pre chelation urine and compared it to an hour of urine collected hour 1-2 after an oral bolus dose of NDF. A wide range of heavy metals increased in the post samples.

Essential minerals like selenium and chromium were also chelated, especially if heavily supplemented. Probably as with IV chelation and routine health care, supplementation is prudent. A study with a larger number of patients is in process to verify these initial findings.

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