

# Chronic Lead Poisoning as a Cause of Bulimia: Hair Analysis and Brain Electrical Activity Mapping (BEAM) as Diagnostic Aid

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A twenty-four year old female, non-smoker diagnosed with an eating disorder, Bulimia, came to PATH for treatment. The patient reported inducing herself to vomit, as well as ingesting laxatives following meals. During the past three years she had worked at a lamp manufacturing company using lead solder, and had become progressively depressed to the point where she would induce one to two bulimia attacks per day. She complained of depression, irritability, nervousness, fear of people, fear in general, preference for solitude, and felt unimportant. Her somatic symptoms included moderate bloating, pain in her wrists and ankles, shortness of breath and craving for sweets and salt. Her psychologist sent her to us stating that he thought her problem must be biochemical, while she thought her problems were psychological.

She had experienced much stress in the last year. Her father was suffering with heart disease (angioplasty) and a close friend had recently died. The patient also stated her father was taking an anti-depressant and her mother was in therapy due to stress. There were more than enough factors to account for her depression, and a psychiatrist she saw suggested anti-depressants, which she refused. Her diet was unhealthy; whereas it consisted of pastry, salty food, caffeine, and junk foods.

In her history she stated that she had been exposed to lead. She claimed that her blood lead level had been tested at her work place and was found to be normal. Low level lead exposure can produce a wide variety of psychiatric syndrome.<sup>1,2</sup>

<sup>3</sup> In January of 1988, her thyroid and routine blood tests were essentially normal except for a slightly elevated cholesterol level of 244 mg/dl, slightly low white blood count of 3100/cu.mm. (normal 3.5-10) and her amino acid test showed that

she was deficient in tryptophane with a level of 6 M.mol/100 ml (normal 7.9 jimol/100 ml). I was also interested in looking at her zinc level in regard to the existing bulimia, which warranted a red blood cell trace element profile analysis (a more valuable compartment for testing than plasma). Her red blood cell lead was .362 ppm (normal .4 ppm). We did not do a blood lead test at this time since the patient reported a normal lead value. However, we did do a hair lead test to see if we could pick up a sub-acute lead poisoning. Her hair lead was 96 ppm, much more than two standard deviations above the mean (10 ppm). In February of 1988, here blood lead level tested normal at 16 ug/dl, but her erythrocyte protoporphyrin was elevated at 40 ug/dl (normal up to 35 ug/dl). Erythrocytic protoporphyrin is an extremely sensitive lead poisoning test.<sup>4</sup> Her zinc protoporphyrin (ZPP) was 37 ug/dl (normal <35 ug/dl). In fact, on checking the records from her local employer, it turned out that four years earlier (June 1985), she had an erythrocyte protoporphyrin of 8 jig/dl (her value was 800% higher!) and a lead level of 24 ug/dl (norm range 0-40 jig/dl). In addition, two years later (June 1987), she had an erythrocyte protoporphyrin of 67 ug/dl and a blood lead of 28 ug/dl. OSHA's range is 0-40 ug/dl (normal ranges - Smith Kline Labs is 0-20 ug/dl, Damon Laboratories 0-15 ug/dl). It is apparent by most standards that she was poisoned by the lead solder. In February of 1988, she was placed on D-penicillamine 250 mg twice daily. Her erythrocyte protoporphyrin was lowered to 29 ug/dl after six weeks of therapy and after eight weeks her lead urine level was less than 10 ug/L (normal up to 80 ug/L). She immediately found relief as she continued with D-penicillamine, for a total of nine weeks, her depression lifted significantly and her bulimia episodes were reduced to three per week as her erythrocyte protoporphyrin continued to fall back to her baseline of 8. She stated, she was feeling the best she had

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felt in years and subsequently went back to college with total remission of bulimia. Lead undoubtedly was a significant, if not primary factor in her Psychopathology. Hair testing can help discover sub-acute and chronic lead poisoning, which causes psychiatric disease. Her psychological inventory was particularly notable during lead poisoning. She suffered from severe headaches under tension. Her psychological inventory showed that she experienced the following signs of depression:

- Music did not sound harmonious anymore
- Whatever she was doing she felt to be doing something else
- Quick movements frightened her
- Sunlight seemed dazzling
- Strange ideas came into her head from no where
- Letters ran into each other
- Sometimes when she was reading the lines printed zig zag up and down
- She must always be on her guard
- She liked to escape her body
- People deceived her all the time
- People act as if she were not there
- Thoughts crowd into her mind too rapidly for discussion
- She had little respect for herself
- Voices of people found sharp and hard
- Everyone seems to have changed lately
- Her skin was very sensitive
- Her body was not exactly symmetrical
- She was bothered by murderous ideas
- She had a feeling of pressure and fullness in her skull
- She said she grew up too fast
- She said she was not the person her mother wanted her to be
- She loathed people who touched her
- She felt she had become a burden
- She hated herself
- She could not visualize herself older than she is now
- Without her work she would be nothing
- She felt lonesome most of the time
- She felt lost in unfamiliar places
- When she touched people's bodies they seemed unusually warm
- She dreaded to pass a grave yard
- She said her conscious gave her no rest
- She felt lost in a crowd
- She thought other people's thoughts
- She thought that she usually knew what was going to happen next

- People look younger than they really are.

These are just some of her signs of depression, sensory dysperception, and anxiety that disappeared with D-penicilin treatment. One would have suspected that this would have been a straight case of some form of psychotic depression. It was really lead poisoning. The fact that it was lead poisoning was proven further by brain electrical activity mapping (BEAM). Lead is known to produce bitemporal encephalopathy. Lead is extremely neurotoxic.<sup>5 6 7 8</sup> The brain map documents why this patient did not get a total remission of her Bulimia, until four months after her lead level lowered. Lead injures the brain but the brain can heal aided by nutrients and she developed a total recovery. She is now free of bulimia for one year.

### **BEAM Summary**

1. Complex EEG is normal. BEAM EEG spectral analysis with eyes open is abnormal due to excessive fast activity (beta two, beta three) in the left frontal pole, possibly due to muscle artifact.
2. BEAM EEG with eyes closed is normal.
3. Cerebral auditory evoked responses are abnormal due to: excessive negative activation at the vertex arid in the left parietal-occipital-temporal regions; excessive positive activation at the left posterior vertex.
4. Cerebral visual evoked responses are abnormal due to: excessive positive activation in the left frontal region; excessive negative activation in the right midtemporal - parietal and right posterior parietal regions.

Probable Diagnosis: Abnormal BEAM consistent with an irritative encephalopathy (348.3).

### **Conclusion**

Lead poisoning changes the Brain Electrical Activity Map (BEAM). BEAM is a very sensitive test of brain injury due to toxins.<sup>9 10</sup> We have been able to follow recovery from brain injury in drug abusers.<sup>11 12</sup> This patient after recovery did not want to go through the trouble to repeat the brain map. To find the origin of brain injury from toxins hair testing may be an aid, other sensitive blood tests may also be useful. Lead poisoning is at least a partially reversible neuroxin to the brain.

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