

# Evidence that Mercury from Silver Dental Fillings May Be an Etiological Factor in Reduced Nerve Conduction Velocity in Multiple Sclerosis Patients

Robert L. Sibley; Eldon Kienholz<sup>1</sup>

## Abstract

Seven multiple sclerosis subjects had their silver dental fillings (amalgams) removed which contained approximately 50% mercury. A visual evoked response (VER) test was performed before amalgam removal. Approximately six months after amalgam removal a second VER test was performed on all subjects, and the latencies of the VER decreased significantly. The mean latency of P1 for the right and left eye combined decreased by 23.1 milliseconds ( $P=0.011$ ) and N1 of the right and left eye combined decreased by 31.7 milliseconds ( $P=0.026$ ). It was hypothesized that mercury from dental amalgam was an etiological factor in reduced nerve conduction velocity in MS subjects.

## Introduction

One of the diagnostic symptoms of multiple sclerosis (MS) is a reduction of nerve conduction velocity as measured by the visual evoked response (VER) test. A characteristic of mercury toxicity is also a slower nerve conduction velocity.<sup>1,2</sup> Evidence has shown that mercury leeches from the silver dental filling commonly called the amalgam<sup>3,4</sup> in the form of mercury vapor. The dental amalgam contains about 50% mercury. Approximately 75% to 80% of inhaled mercury vapor passes into the blood stream and is transported to all parts of the body.<sup>5,6</sup> Mercury vapor from the amalgam is in the elemental form, and when in this form it can pass the blood

brain barrier before being ionized.<sup>7</sup> After ionization, it then becomes entrapped within the brain. Epidemiology studies have correlated dental fillings with multiple sclerosis.<sup>8</sup> Mercury is known to demyelinate nerve fibers,<sup>9</sup> can damage the blood brain barrier,<sup>9</sup> and can slow the nerve conduction velocity,<sup>1,2</sup> all of which are found in MS. Ahlrot-Westerlund<sup>10</sup> compared mercury levels of cerebral spinal fluid of MS subjects to a control group without MS and found mercury levels were eight times higher in the MS group. Mercury also has the ability to cause autoimmune reactions which is the leading theory on the etiology of MS.<sup>11,12</sup> A study by Sibley and Kienholz<sup>13</sup> found that multiple sclerosis subjects who had their dental amalgams removed reported 34% fewer exacerbations than a control group of multiple sclerosis subjects with dental amalgams. The amalgam removal group had significantly high total T-lymphocytes and (CD8) suppressor cells. After hearing the hypothesis of the relationship of mercury and MS, many MS subjects have had their amalgams removed. This study reports on the before and after results of the visual evoked response of seven MS subjects who had their dental amalgams removed for this study.

## Methods

An ad was placed in a Denver newspaper asking for MS subjects with silver dental fillings to participate in a research study. Seven female MS patients volunteered for the study. They averaged 37.7 years in age (age range, 32-46). To confirm their diagnosis of MS, an MRI (Magnetic Resonance

1. Rocky Mountain Research Institute, Inc. 1304 South College Avenue Ft. Collins, CO 80524  
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Imaging) test was performed on all subjects by MDMRI in Denver. The MRI confirmed central nervous system lesions for all patients in this study. Before the removal of amalgams, the seven MS subjects underwent a visual evoked response (VER) test. The test stimulus was a checkerboard pattern reversal. Each subject was tested for two trials for each eye. The average of the two trials was measured for the P1 and N2 of the VER. Each subject was then assigned to a dentist in Colorado who had stopped using silver/mercury fillings. Seven dentists volunteered their services for the research, and the dental amalgams of the subjects were replaced by a composite material that did not contain mercury. Six months after amalgam removal, the VER testing was repeated. Testing was performed without examiner knowledge of the first VER test results. Latency measures of the primary components of the VER (P1 and N2) were analyzed by analysis of variance and the student "t" test by the Statistical Lab at Colorado State University.

## Results

Of the seven subjects, five showed a decrease in the mean latency of the P1 and N2 components of the VER (Table 1, p. 171) after removal of their dental amalgam. As shown in Table 2, (p. 171), the average change for P1 was 23.1 milliseconds ( $p=0.011$ ) and for N2, 31.7 milliseconds ( $p=0.0026$ ). The mean latencies of P1 in the right eye decreased for the group by an average of 25.4 milliseconds ( $p=0.051$ ) while N2 decreased by 32.8 milliseconds ( $p=0.036$ ). In the left eye, the mean latencies decreased by 20.1 milliseconds ( $p=0.072$ ) for P1 and by 30.7 milliseconds ( $p=0.086$ ) for N2.

## Discussion

The findings presented here are consistent with the hypothesis that mercury from dental amalgam may be associated with multiple sclerosis. When the dependent variables of VER latencies were com-

pared before and after amalgam removal, there was a significant decrease in latencies after removal. Clinical evidence has shown that mercury slows the nerve conduction velocity. Median motor, median sensory, and sural nerve conduction velocity was measured in 16 workers who were chronically exposed to various inorganic mercury compounds.<sup>1</sup> The subjects were compared to an unexposed control group. A significant slowing of the median motor nerve was found which correlated to increased levels of mercury in blood and urine. Levine and coworkers<sup>14</sup> found that elemental mercury reduced both motor and sensory peripheral nerve conduction on factory workers exposed to mercury. They found significant correlations between increased urine mercury concentrations and prolonged motor and distal latencies. One of the consequences of demyelinating lesions is the slowing of nerve conduction velocities.<sup>15</sup> It is likely that slowed conduction contributes to the delay in the visual evoked potential, but it's not known if it can account for the whole delay. It is thought that there could be a delay in the generation of the cortical response as a result of conduction block in a proportion of the incoming fibers. It is known that mercury can cause demyelination of nerve fibers.<sup>9</sup> Studies by Eggleston and Nylander<sup>16</sup> found a direct correlation between the number of amalgams and brain mercury in post mortem studies. McDonald<sup>15</sup> concludes in his textbook that there are a number of mechanisms which could account for the delay seen in the visual evoked potential, but the contribution of each is uncertain. Perhaps we are seeing mercury's affect on the neurotransmitters. Mercury has the ability to inhibit the uptake of dopamine at synapses.<sup>17</sup> It can also inhibit the binding of serotonin<sup>18</sup> at the synaptic site. Rajanna, et al.,<sup>19</sup> found that mercury decreased norepinephrine uptake in brain synapses and yet another study<sup>20</sup> found that mercury can block the release

**Table 1.** Visual evoked response latency of P1 and N2 (milliseconds before and after amalgam removal).

1	Before	122.0	162.0	100.0	153.0
	After	85.2	121.2	75.6	100.8
2	Before	110.4	142.8	99.6	121.2
	After	58.8	110.4	69.6	105.6
3	Before	155.0	199.0	156.0	216.0
	After	117.0	151.0	123.6	151.2
4	Before	110.4	165.6	103.4	145.6
	After	76.8	110.4	74.4	157.2
5	Before	98.4	169.2	106.0	217.0
	After	72.0	104.4	69.6	105.6
6	Before	88.8	114.0	91.2	122.4
	After	92.4	124.8	93.6	126.7
7	Before	144.0	178.0	140.0	175.0
	After	148.8	178.8	148.8	188.4

**Table 2.** Visual evoked response mean latencies of P1 and N2 (milliseconds).

Mean Before	After	Difference	F	t value	P
P1- right eye	118.4	93.0	25.4	3.50	0.051
N2- right eye	161.51	128.71	32.8	4.46	0.036
P1- left eye	113.74	93.60	20.1	2.70	0.072
N2- left eye	164.31	133.61	30.7	2.31	0.086
Before	After	Difference	F	t value	P
P1-right and left eye	116.1	93.0	23.1	3.10	0.011
P2- right and left eye	162.9	131.2	31.7	2.43	0.026

of acetylcholine. If mercury is interfering with synaptic conduction of the nerve impulse, one would expect a slower nerve conduction velocity and a delay in the visual evoked response.

### Conclusion

This study presents evidence that the visual evoked response latencies decreased significantly in five of seven MS patients after removal of amalgams that contain approximately 50% mercury. Because previous studies have shown that people exposed to mercury vapor have a reduction in nerve conduction velocity, it can be hypothesized that mercury in dental amalgams may be an etiological factor in reduced nerve conduction velocity found in multiple sclerosis patients.

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