Neuropsychological Effects of Lead Poisoning: The Forensic Implications of the Flint Water Crisis

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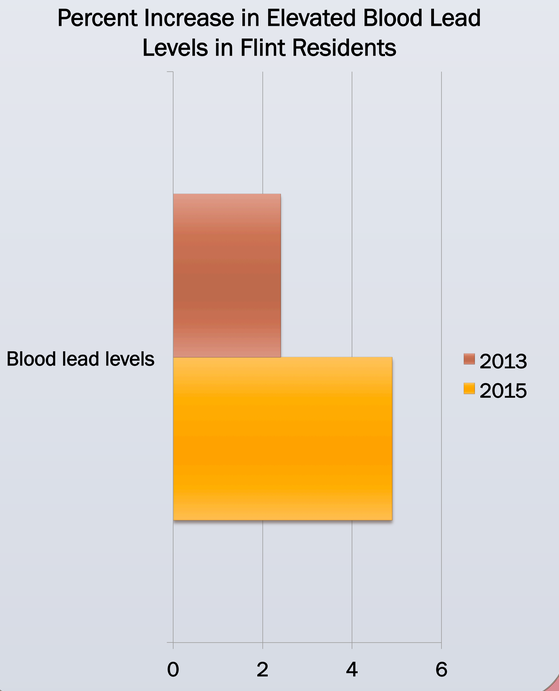
PREVALENCE OF LEAD POISONING IN FLINT RESIDENTS

- Since 2014, Flint residents – mostly African American – have complained to city officials that their tap water was foul and discolored. Two years elapsed before the Flint Independent Task Force found government fault for high levels of lead in the city water supply (Gostin, 2016).
- From 2013 to 2015, incidence of elevated blood lead levels in Flint citizens increased significantly (see figure); neighborhoods with the highest water lead levels experienced a 6.6% increase (Hanna-Attisha, LaChance, Sadler & Schnepp, 2016).
- Elevated blood lead levels are gravely concerning because lead is a neurotoxic metal (Wang, 2016).



NEUROPSYCHOLOGICAL EFFECTS

- Lead exposure can be detrimental to every organ in the human body, but the brain is particularly susceptible to its deleterious effects (Akshatha, Rukmini, Mamatha, Sadashiva & Prashanth, 2014).
- People consuming lead infected water are at risk for impairments in intellectual functioning, memory, learning, and attention. Lead's ability to substitute for calcium, and possibly zinc, is a factor common to many of its toxic actions (Pabello, 2005).
- Lead also affects two protein complexes, protein kinase C and the N-methyl-D-aspartate subtype of glutamate receptor.
- Lead has also been associated with a reduction in gray matter volume in the frontal lobes (Brubaker, Dietrich, Lanphear & Cecil, 2010).

LEGAL FACTORS

- Over 1,700 Flint residents have filed a class action lawsuit totaling over $700 million in compensation for personal and property damage caused by the crisis. The numbers of cases associated with neurological effects are undetermined at this time, but more lawsuits by residents are expected.

LEGAL FACTORS

- Negative effects of the Flint water crisis may be confounded by other environmental factors such as demolition projects by the Genesee County Land Bank Authority and Flint's significant automobile history (Hanna-Attisha et al., 2016). Abandoned auto factories and demolition projects have left paint and batteries throughout Flint, contributing to lead in the water.

RELEVANT RESEARCH

- Less than 5 micrograms/deciliter can have a detrimental impact on a child's cognitive abilities (CDC, 2017). However, the minimum amount of lead that impacts adults is still unclear.
- Children can absorb 40% to 50% of an oral dose of water-soluble lead compared with 3% to 10% for adults (Hanna-Attisha et al., 2016). This implies that there is no safe level of pediatric lead exposure but there may be a safe level for adults (Earl, Burns, Nettelbeck & Baghurst, 2016).
- The Centers for Disease Control and Prevention (CDC) suggests that the safe level for adults is 5 micrograms/deciliter (mcg/dl), but some researchers indicate that there is no safe level.

RELEVANT RESEARCH

- In Flint, about 40% of homes had 0.5 mcg/dl. The 90th percentile for lead exposure was 2.5 mcg/dl, and in some samples the concentration exceeded 100 mcg/dl (www.FlintWaterStudy.org).

ROLE OF FORENSIC PSYCHOLGISTS

- In response to the Flint water crisis, forensic psychologists may be asked to perform neuropsychological assessments for civil litigation cases. Psychologists who participate in these cases should be aware of research on the neuropsychological effects of lead and possible environmental confounds mentioned above.

CONCLUSION

- Flint's water crisis warrants further investigation of the neuropsychological effects on residents caused by consumption and/or use of the lead infected water.
- Although correlation does not equal causation, the current issue should not be ignored.
- Interventions are required to prevent any further neuropsychological effects from lead poisoning.

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