

Home > Journal > Earth & Environmental Sciences > JEP

[Indexing](#) [View Papers](#) [Aims & Scope](#) [Editorial Board](#) [Guideline](#) [Article Processing Charges](#)

JEP > Vol.2 No.9, November 2011

OPEN ACCESS

## Lead Remediation of Contaminated Water by Charcoal, LA Red Clay, Spinach, and Mustard Green

PDF (Size: 167KB) PP. 1240-1244 DOI: 10.4236/jep.2011.29142

### Author(s)

Lovell Agwaramgbo, Eucharia Agwaramgbo, Chanel Mercadel, Shelby Edwards, Eric Buckles

### ABSTRACT

Lead is a toxic and naturally occurring substance with documented neurotoxin, toxic, and long-lasting adverse health effects globally. Lead exposure can cause impaired physical and mental development in children. Exposure to high lead levels affects the intestinal tract, kidneys, joints and reproductive system in adults. This study evaluates the removal of 1500 PPM of lead from contaminated aqueous solution using Celite, Louisiana Red Clay, Charcoal, and supernatants from aqueous extracts of Mustard Green (*Brassica juncea*), and Spinach (*Spinacea oleracea*). After shaking triplicate reaction mixtures for each substrate for 22 hours at room temperature, lead removal by the five substrates were analyzed by EPA Method 6010, using Inductively Coupled Plasma-Atomic Emission Spectrometry (ICP-AES). Results suggest that the order of lead removal is Spinach (98%) > Charcoal (96%) > LA Red Clay (88%) > Mustard Green (87%) > Celite (4%). The study concludes that liquid substrates such as the supernatants from pureed spinach and mustard green can effectively remove lead from contaminated water.

### KEYWORDS

Remediation, Heavy Metal, Lead, Water Contamination, Spinach, Contaminated Water

### Cite this paper

L. Agwaramgbo, E. Agwaramgbo, C. Mercadel, S. Edwards and E. Buckles, "Lead Remediation of Contaminated Water by Charcoal, LA Red Clay, Spinach, and Mustard Green," *Journal of Environmental Protection*, Vol. 2 No. 9, 2011, pp. 1240-1244. doi: 10.4236/jep.2011.29142.

### References

- [1] S. Tong, Y. E. von Schirnding and T. Prapamontol, " Environmental Lead Exposure: A Public Health Problem of Global Dimensions," *Bulletin of the World Health Organization*, Vol. 78, No. 9, 200, pp. 1068-1077.
- [2] U. Forstner, " Land Contamination by Metals: Global Scope and Magnitude of Problem," In: H. E. Allen, C. P. Huang, G. W. Bailey and A. R. Bowers, Eds., *Metal Speciation and Contamination of Soil*, CRC Press, Boca Raton, 1995. p.133.
- [3] R. M. Brooks, M. Bahadory, F. Tovia and H.n Rostami, " Removal of Lead from Contaminated Water," *International Journal of Soil, Sediment, & Water*, Vol. 3, No. 2, 2010, pp. 1-14.
- [4] M. S. Laidlaw, H. W. Mielke, G. M. Filippelli, D. L. Johnson and C. R. Gonzales, " Seasonality and Children' s Blood Lead Levels: Developing a Predictive Model using Climatic Variables and Blood Lead Data from Indianapolis, Indiana, Syracuse, New York and New Orleans, Louisiana (USA)," *Environmental Health Perspectives*, Vol. 113, No. 6, 2005, pp. 793-800. doi:10.1289/ehp.7759
- [5] A. J. Shaw, " Heavy Metal Tolerance in Plants: Evolutionary Aspects," CRC Press, Boca Raton, 1990, p. 268.
- [6] A. S. Moffat, " Plants Proving Their Worth in toxic metal cleanup," *Science*, Vol. 269, 1995, pp. 302-303. doi: 10.1126/science.269.5222.302
- [7] R. Chaney and H. Mielke, " Standard for Soil Lead limitations in the United States, Trace Substance,"

- [Open Special Issues](#)
- [Published Special Issues](#)
- [Special Issues Guideline](#)

[JEP Subscription](#)

[Most popular papers in JEP](#)

[About JEP News](#)

[Frequently Asked Questions](#)

[Recommend to Peers](#)

[Recommend to Library](#)

[Contact Us](#)

Downloads: 301,502

Visits: 673,287

Sponsors, Associates, and Links >>

- [The International Conference on Pollution and Treatment Technology \(PTT 2013\)](#)

- [8] T. Sardis, M. K. Chettri, A. Papaioannou, G. Zachariadis and J. Stratis, " A Study of Metal Distribution from fuels, using trees as Biological Monitors," *Ecotoxicology and Environmental Safety*, Vol. 48, No. 1, 2001, pp. 27-35. doi:10.1006/eesa.2000.2001
- [9] J. Cotter-Howells and I. Thornton, " Sources and Pathways of Environmental Lead to Children in a Derbyshire Mining Village," *Environmental Geochemistry and Health*, Vol. 13, No. 2, 1991, pp. 127-135. doi:10.1007/BF01734304
- [10] M. Weitzman, A. Aschengrau, D. Bellinger and R. Jones, " Lead Contaminated Soil Abatement and Urban Children' s Blood Lead Levels," *JAMA: The Journal of the American Medical Association*, Vol. 269, No. 13, 1993, pp. 1647-1654.
- [11] H. W. Mielke, J. L. Adams, P. L. Reagan and P. W. Mielke Jr., " Soil-dust Lead and Childhood Lead Exposure as a Function of City Size and Community Traffic Flow," *The Case for Lead Contaminated Soil Abatement in Minnesota*, *Environmental Geochemistry and Health*, Lead in Soil: Issues and Guidelines, Suppl. 9, 1989, pp. 253-271.
- [12] H. W. Mielke, " Lead Dust Contaminated USA Communities, Comparison of Louisiana and Minnesota," *Applied Geochemistry*, Vol. 8, Suppl. 2, 1993, pp. 257-261. doi:10.1016/S0883-2927(09)80046-2
- [13] Q.Y. Ma, T. J. Logan and S. J. Traina, " Lead Immobilization from Aqueous Solutions and Contaminated Soils Using Phosphate Rocks," *Environmental Science & Technology*, Vol. 29, 1995, pp. 1118-1126. doi:10.1021/es00004a034
- [14] M. Rotkin-Ellman, G. Solomon, C. R. Gonzales, L. Agwaramgbo and H. W. Mielke, " Arsenic Contamination in New Orleans Soil: Temporal Changes Associated with Flooding," *Environmental Research*, Vol. 110, No. 1, 2010, pp. 19-25. doi:10.1016/j.envres.2009.09.004
- [15] L. Agwaramgbo, J. Smith-Hopkins, A. Hawkins and D. Wilson, " Re-Examination of Lead and Arsenic Contamination in New Orleans Parish School Soils," *Chemical and Engineering News*, American Chemical Society, CHED-TECH 33, American Chemical Society, Conference, New Orleans, 17 March 2008.
- [16] M. A. Smith, " Lead in History," In: R. Lansdown and W. Yule, Eds., *Environmental Toxicology and Child Health*, The Lead Debate, London, 1984, pp. 7-24.
- [17] G. W. Goldstein, " Neurological Concepts of Lead Poisoning in Children," *Pediatric Annals*, Vol. 21, No. 6, 1992, pp. 384-388.
- [18] S. Tong, " Lead Exposure and Cognitive Development: Persistence and a Dynamic Pattern," *Journal of Pediatrics and Child Health*, Vol. 34, No. 2, 1998, pp. 114-118. doi:10.1046/j.1440-1754.1998.00187.x
- [19] M. L. Miranda, K. Dohyeong, M. A. Galeano, C. J. Paul, A. P. Hull and S. P. Morgan, " The Relationship between Early Childhood Blood Lead Levels and Performance on End-of-Grade Tests," *Environmental Health Perspectives*, Vol. 115, No. 8, 2007, pp. 1242-1247. doi:10.1289/ehp.9994
- [20] R. L. Canfield, C. R. Henderson Jr., D. A. Cory-Slechta, C. Cox, T. A. Jusko and B. P. Lanphear, " Intellectual Impairment in Children with Blood Lead Concentrations below 10 ?g per Deciliter," *New England Journal of Medicine*, Vol. 348, 16, 2003, pp. 1517-1526. doi:10.1056/NEJMoa022848
- [21] H. Needleman, C. McFarland, R. Ness, S. Fienberg and M. Tobin, " Bone Lead Levels in Adjudicated Delinquents: A Case Control Study," *Neurotoxicology and Teratology*, Vol. 24, No. 6, 2003, pp. 711-717. doi:10.1016/S0892-0362(02)00269-6
- [22] R. A. Shih, H. Hu, M. G. Weisskopf and B. S. Schwartz, " Cumulative Lead Dose and Cognitive Function in Adults: A Review of Studies That Measured Both Blood Lead and Bone Lead," *Environmental Health Perspectives*, Vol. 115, No. 3, 2007, pp. 483-492. doi:10.1289/ehp.9786
- [23] J. L. Lin, D. T. Lin-Tan, K. H. Hsu and C. C. Yu, " Environmental Lead Exposure and Progression of Chronic Renal Diseases in Patients without Diabetes," *New England Journal of Medicine*, Vol. 348, 2003, pp. 277-286. doi:10.1056/NEJMoa021672
- [24] R. Nevin, " Understanding International Crime Trends: The Legacy of Preschool Lead Exposure," *Environmental Research*, Vol. 104, No. 3, 2007, pp. 315-336. doi:10.1016/j.envres.2007.02.008
- [25] P. B. Stretesky and M. J. Lynch, " The Relationship between Lead Exposure and Homicide," *Archives*

of Pediatric and Adolescent Medicine, Vol. 155, No. 5, 2001, pp. 579-582.

- [26] C. Evanko and D. Dzonbak, "Remediation of Metal Contaminated Soils and Groundwater," Groundwater Remediation Technologies Analysis Report, Series b TE-97-01, 1997, pp. 1-53.