

Topic: Lead in Tap Water

Title: Use of a Cumulative Exposure Index to Estimate the Impact of Tap-Water Lead Concentration on Blood Lead Levels in 1- to 5-Year-Old Children (Montreal, Canada)

Conclusion: In Montreal children aged 1 to 5 years old, an increase of 1 µg/L in water lead would result in an increase of 35% of blood lead level after 150 days of exposure.

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Abstract:

Background: Drinking water is recognized as a source of lead (Pb) exposure. However, questions remain about the impact of chronic exposure to lead-contaminated water on internal dose.

Objective: To estimate the relation between a cumulative water Pb exposure index and blood Pb levels (BPb) in children aged 1 to 5 years.

Methods: Between September 10, 2009 and March 27, 2010, individual characteristics and water consumption data were obtained from 298 children. Venous blood samples were collected (one per child) and a total of five 1-L samples of water per home were drawn from the kitchen tap. A second round of water collection was performed between June 22, 2011 and September 6, 2011 on a subsample of houses. Pb analyses used inductively coupled plasma mass spectroscopy. Multiple linear regressions were used to estimate the association between the cumulative water Pb exposure index and BPb.

Results: Each 1-unit increase in the cumulative water Pb exposure index multiplies the expected value of BPb by 1.10 (95%CI: 1.06, 1.15) after adjustment for confounders. Mean BPb was significantly higher in children in the upper third and fourth quartiles of the cumulative water Pb exposure index (0.7 – 1.9 and ≥ 1.9 µg/kg of body weight) compared with the first (< 0.2 µg/kg) after adjusting for confounders (19%; 95% CI: 0, 42% and 39%; 95% CI: 15, 67%, respectively). The trends analysis yielded a p-value < 0.0001 after adjusting for confounders suggesting a dose-response relationship between percentiles of the cumulative water Pb exposure index and BPb.

Conclusions: In children aged 1 to 5 years, BPb was significantly associated with water lead concentration with an increase starting at a cumulative lead exposure of ≥ 0.7 µg Pb/kg of body weight. In this age group, an increase of 1 µg/L in water lead would result in an increase of 35% of BPb after 150 days of exposure.