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Running Title: Arsenic on Children's Hands

Key words: arsenic, playgrounds, chromated copper arsenate, treated wood, children's exposure, CCA

Abbreviations:

CCA chromated copper arsenate

ICPMS inductively coupled plasma mass spectrometry

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Abstract

Increasing concerns over the use of wood treated with chromated copper arsenate (CCA) in playground structures arise from potential exposure to arsenic by children playing in these playgrounds. Limited data from previous studies analyzing arsenic levels in sand samples collected from CCA playgrounds are inconsistent, and cannot be directly translated to the amount of arsenic exposure by children. The objective of this study was to determine the quantitative amounts of arsenic on the hands of children in contact with CCA-treated wood structures or sand in playgrounds. Arsenic levels on the hands of 66 children playing in eight CCA playgrounds were compared to levels of arsenic found on the hands of 64 children playing in another eight playgrounds not constructed with CCA-treated wood. The children's age and duration of playtime were recorded at each playground. After playing, children's hands were washed in a bag containing 150 mL of deionized water. Quantification of arsenic levels in the hand-washing water was conducted by means of inductively coupled plasma mass spectrometry. Our results show that the ages of the children sampled and the duration of play in the playgrounds were similar between the groups of CCA and non-CCA playgrounds. The mean amount of water-soluble arsenic on children's hands from CCA playgrounds was 0.50 μg (range: 0.0078-3.5 μg). This was significantly higher ($p < 0.001$) than the mean amount of water-soluble arsenic on children's hands from non-CCA playgrounds, which was 0.095 μg (range: 0.011-0.41 μg). There was no significant difference in the amount of sand on the children's hands and the concentration of arsenic in the sand between the CCA and non-CCA groups. The higher values of arsenic on the hands of children playing in the CCA playgrounds are probably due to the direct contact with CCA-treated wood. Washing hands after play would reduce the levels of potential exposure because most of the arsenic on children's hands was washed off with water.

The maximum amount of arsenic on children's hands from the entire group of study participants was less than 4 μg , which is lower than the average daily intake of arsenic from water and food.