Arsenic on the Hands of Children after Playing in Playgrounds

Elena Kwon, Hongquan Zhang, Zhongwen Wang, Gian S. Jhangri, Xiufen Lu, Nelson Fok, Stephan Gabos, Xing-Fang Li, and X. Chris Le

doi:10.1289/ehp.7197 (available at http://dx.doi.org/)

Online 17 June 2004
Arsenic on the Hands of Children after Playing in Playgrounds

Elena Kwon¹, Hongquan Zhang¹, Zhongwen Wang¹, Gian S. Jhangri¹, Xiufen Lu¹, Nelson Fok²,
Stephan Gabos³, Xing-Fang Li¹, and X. Chris Le¹*

1. University of Alberta, Department of Public Health Sciences, 10-102 Clinical Sciences
   Building, Edmonton, Alberta, Canada T6G 2G3
2. Environmental Health, Capital Health, Edmonton, Alberta, Canada
3. Health Surveillance Branch, Alberta Health and Wellness, Edmonton, Alberta, Canada

* To whom correspondence should be addressed at the Department of Public Health Sciences,
  Faculty of Medicine, University of Alberta, 10-102 Clinical Sciences Building, Edmonton,
  Alberta, Canada T6G 2G3
Telephone: (780) 492-6416; Fax: (780) 492-7800; E-mail: xc.le@ualberta.ca
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

Acknowledgments: This study was supported by the Natural Sciences and Engineering Research Council (NSERC), the Alberta Heritage Foundation for Medical Research (AHFMR), Alberta Health and Wellness, Capital Health, the City of Edmonton, and Environment Canada. We thank Paul Cardinal, Dale Ehrman, Curtis Englot, Doug Kirchner, Rick Zolkiewski, Warren Ma, and Katerina Carastathis for their contribution to this study. We thank EnviroTest Laboratories (Edmonton, Alberta) for performing the analysis of arsenic in soil samples. We also thank the participating children and their parents for their co-operation.

Outline of manuscript section headers
Abstract
Introduction
Results
Discussion
Conclusions
References
Tables 1-4
Figure captions
Figures 1-3
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.