

A mass balance approach for evaluating leachable arsenic and chromium from an in-service CCA-treated wood structure

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Abstract

Many existing residential wood structures, such as playsets and decks, have been treated with chromated copper arsenate (CCA). This preservative chemical can be released from these structures incrementally over time through contact with rainfall. The objective of this study was to evaluate the levels of arsenic and chromium leached from an in-service CCA-treated deck exposed to rainfall, as well as their possible impacts on soils and shallow groundwater. Two monitoring stations, one containing a CCA-treated deck and the other containing an untreated deck as a control, were constructed outside for this study. Rainfall, runoff water from the decks, soils below the decks, and infiltrated water through 0.7-m depth of soil were monitored for arsenic and chromium over a period of 3 years. The concentration of the CCA-treated deck runoff for arsenic (0.114–4.66 mg/L) and chromium (0.008–0.470 mg/L) were significantly ($p < 0.001$) higher than the untreated deck runoff (≤ 0.002 mg/L for both). During the 3-year monitoring period, 13% of the arsenic and 1.4% of the chromium were leached from the amount initially present in the CCA-treated wood. Arsenic levels (< 0.1 –46 mg/kg) in soils under the CCA-treated deck were significantly ($p < 0.001$) higher than under the untreated deck (< 0.1 –2.7 mg/kg), while chromium levels were statistically the same below the two decks (2.4–9.6 mg/kg). Approximately 94% of the arsenic from the runoff was absorbed in the soils below the CCA-treated deck; the upper 2.5 cm of the soils captured 42% of the total. The infiltrated water concentrations for arsenic (< 0.001 –0.085 mg/L) and chromium (< 0.001 –0.010 mg/L) below the CCA-treated deck were both significantly ($p < 0.001$) higher than below the untreated deck (≤ 0.006 mg/L). The amounts of arsenic found in the infiltrated water below the CCA-treated deck represented 6% of total arsenic leached and less than 0.7% of the initial mass in the wood. The study demonstrated that exposure of a CCA-treated deck to rainfall resulted in elevated arsenic concentrations in both runoff and soil. Although only a relatively small fraction of the initial arsenic from the wood

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