

Exposure to chrysotile asbestos associated with unpacking and repacking boxes of automobile brake pads and shoes

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Industrial hygiene surveys and epidemiologic studies of auto mechanics have shown that these workers are not at an increased risk of asbestos-related disease; however, concerns continue to be raised regarding asbestos exposure from asbestos-containing brakes. Handling new asbestos containing brake components has recently been suggested as a potential source of asbestos exposure. A simulation study involving the unpacking and repacking of 105 boxes of brakes (for vehicles ca. 1946–80), including 62 boxes of brake pads and 43 boxes of brake shoes, was conducted to examine how this activity might contribute to both short-term and 8-h time-weighted average exposures to asbestos. Breathing zone samples on the lapel of a volunteer worker ($n = 80$) and area samples at bystander (e.g., 1.5 m from worker) ($n = 56$), remote area ($n = 26$) and ambient ($n = 10$) locations collected during the unpacking and repacking of boxes of asbestos containing brakes were analyzed by phase contrast microscopy and transmission electron microscopy. Exposure to airborne asbestos was characterized for a variety of parameters including the number of boxes handled, brake type (i.e. pads versus shoes) and the distance from the activity (i.e. worker, bystander and remote area). This study also evaluated the fiber size and morphology distribution according to the International Organization for Standardization analytical method for asbestos. It was observed that (i) airborne asbestos concentrations increased with the number of boxes unpacked and repacked, (ii) handling boxes of brake pads resulted in higher worker asbestos exposures compared to handling boxes of brake shoes, (iii) cleanup and clothes-handling tasks produced less airborne asbestos than handling boxes of brakes and (iv) fiber size and morphology analysis showed that while the majority of fibers were free (e.g. not associated with a cluster or matrix), <30% were respirable and even fewer were of the size range (>20 nm length) considered to pose the greatest risk of asbestos-related disease. It was found that average airborne chrysotile concentrations (30 min) ranged from 0.086 to 0.368 and 0.021 to 0.126 f cc⁻¹ for a worker unpacking and repacking 4–20 boxes of brake pads and 4–20 boxes of brake shoes, respectively. Additionally, average airborne asbestos exposures (30 min) at bystander locations ranged from 0.004 to 0.035 and 0.002 to 0.011 f cc⁻¹ when 4–20 boxes of brake pads and 4–20 boxes of brake shoes were handled, respectively. These data show that a worker handling a relatively large number of boxes of brakes over short periods of time will not be exposed to airborne asbestos in excess of its historical or current short term occupational exposure limits.

Keywords: asbestos, automobile brakes, exposure assessment