

Chrysotile asbestos exposure associated with removal of automobile exhaust systems (ca. 1945–1975) by mechanics: Results of a simulation study

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For decades, asbestos-containing gaskets were used in virtually every system that involved the transport of fluids or gases. Prior to the mid-1970s, some automobile exhaust systems contained asbestos gaskets either at flanges along the exhaust pipes or at the exhaust manifolds of the engine. A limited number of automobile mufflers were lined with asbestos paper. This paper describes a simulation study that characterized personal and bystander exposures to asbestos during the removal of automobile exhaust systems (ca. 1945–1975) containing asbestos gaskets. A total of 16 pre-1974 vehicles with old or original exhaust systems were studied. Of the 16 vehicles, 12 contained asbestos gaskets in the exhaust system and two vehicles had asbestos lining inside the muffler. A total of 82 samples (23 personal, 38 bystander, and 21 indoor background) were analyzed by Phase Contrast Microscopy (PCM) and 88 samples (25 personal, 41 bystander, and 22 indoor background) by Transmission Electron Microscopy (TEM). Only seven of 25 worker samples analyzed by TEM detected asbestos fibers and 18 were below the analytical sensitivity limit (mean 0.013 f/cc, range 0.001–0.074 f/cc). Applying the ratio of asbestos fibers:total fibers (including non-asbestos) as determined by TEM to the PCM results showed an average (1 h) adjusted PCM worker exposure of 0.018 f/cc (0.002–0.04 f/cc). The average (1 h) adjusted PCM airborne concentration for bystanders was 0.008 f/cc (range 0.0008–0.015 f/cc). Assuming a mechanic can replace four automobile single exhaust systems in 1 workday, the estimated 8-h time-weighted average (TWA) for a mechanic performing this work was 0.01 f/cc. Under a scenario where a mechanic might repeatedly conduct exhaust work, these results suggest that exposures to asbestos from work with automobile exhaust systems during the 1950s through the 1970s containing asbestos gaskets were substantially below 0.1 f/cc, the current PEL for chrysotile asbestos, and quite often were not detectable.

Keywords: *chrysotile asbestos, gasket, automobile exhaust system, mechanic, occupational exposure.*