

D17 The Curious Case of Asbestos Disease Among Dental Technicians

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Learning Overview: The goal of this presentation is to inform the forensic science community as to how studies can be designed to use forensic microscopical analysis to determine historical exposures to asbestos related to dental technicians.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by increasing understanding of the considerations necessary when planning and executing tests to determine historical exposures to hazardous particulates, such as asbestos.

In 1976, after a review of death certificates, Menck and Henderson concluded in their *Journal of Occupational Medicine* article that “Occupational groups found to be at excess risk (of asbestos disease) who have not been previously implicated included roofers, dental technicians ...”.¹ An explanation for the rather surprising entry of “dental technicians” among those with excess risk of asbestos disease was provided in that same year in a report that the Councils on Dental Therapeutics and on Dental Materials and Devices published in the *Journal of the American Dental Association*.² It noted that asbestos had been used in dental ring lining tape. From the 1930s until sometime in the 1980s, the inner surface of a crucible or ring used in the “lost wax method” of casting dental prostheses was lined with the asbestos tape prior to casting at a high temperature. In 1980, dentists at the Army Institute of Dental Research in Washington reported on their use of a Scanning Electron Microscopy (SEM) to find that asbestos fibers are released when ring liner was torn from a roll of asbestos by laboratory workers but did not determine the amounts.³

To investigate the potential asbestos exposure from dental tape, forensic and occupational microscopy testing was done with Polarized Light Microscopy (PLM), Phase Contrast Microscopy (PCM), Scanning Electron Microscopy (SEM), and Transmission Electron Microscopy (TEM). Chrysotile asbestos contents ranging from 40% to 95% were found in two popular brands of dental tape. Small levels of tremolite asbestos were also found in the tapes. Glovebox testing based on Consumer Product Safety Commission and the United States Environmental Protection Agency protocols was used to determine the levels of asbestos released during the tearing of dental tape. The glove box testing was done in a NuAire 401 sealed glove box (365 liter volume). The released particles were collected on standard air filter cassettes (0.8µm Master Water Conditioning® [MCA] filters) at flow rates between 1 and 5 liters per minute. The filters were examined for fibers using PCM National Institute for Occupational Safety and Health (NIOSH) 7400 procedure and TEM NIOSH 7402.

The glove box tests showed levels ranged from 0.5–4 Fibers/cc. Full chamber tests were done with a protected individual in a controlled room. The test chamber work area was approximately 9ft high by 10ft wide by 12ft long. The study area had a High Efficiency Particulate Absolute (HEPA) air filtration device that was used to clean the area of particulate, including asbestos, before the testing activities began. The HEPA unit ran at a low flow-rate (approximately 45 cubic feet per minute) during the study. Air samples collected and analyzed as described for the glove box studies showed levels of 0.66–4.6 Fibers/cc. Additional glove box tests showed that over 120,000 asbestos fibers (>5 micrometers long) were released during a pair of tears.

Reference(s):

1. Herman Menck and Brian Henderson. Occupational differences in rates of lung cancer. *J. Occup. Med.* 18, no.12 (1976): 797-801.
2. Council on Dental Therapeutics and Council on Dental Materials and Devices. Hazards of Asbestos in Dentistry. Reports of Councils and Bureaus. *J. American Dental Association*, 92 (1976): 777-778.
3. Duane Cutright, Eugene Huget, and John Brady. Asbestos: A Subtle Carcinogen in the Dental Laboratory, SEM and Microprobe Study. *General Dentistry*, 28, no. 3 (1980): 46-50

Microscopy, Asbestos, Dental Tape