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The Hazards of Asbestos for Brake Mechanic

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ASBESTOS is the generic name of a group of hydrated magnesium silicate mineral fibers. There are two groups of these minerals—serpentine (chrysotile) and amphibole (amosite, crocidolite, anthophyllite, tremolite, and actinolite). Ninety-five percent of the world's asbestos production is chrysotile.

Reports of epidemiologic and pathological studies (1-4) reveal that occupational exposure to commercial asbestos minerals enhances the likelihood of a number of diseases—asbestosis and cancers of the lung, pleura, peritoneum, larynx, and gastrointestinal tract. The time from onset of exposure to the time of clinically apparent disease is usually more than 20 years. Cancer from asbestos is not limited to workers who handle the material. There are also reports of pleural and peritoneal mesothelioma (tumors rarely seen in the general population) in persons with family, or neighborhood, or indirect occupational exposure to asbestos (4-7).

Mesothelioma was the cause of death of a man who had regularly sanded vinyl asbestos floor tile (8). Under simulated conditions of this man's work, a maximum asbestos dust concentration of 1.3 fibers per mil (fibers longer than 5 microns) was found in air samples passed through membrane filters worn by a person sanding vinyl asbestos (8). The type of asbestos now used in domestic floor tile is chrysotile—the same as that used in brake friction materials, according to the Asbestos Information Association. A case of mesothelioma in a brake mechanic has been reported (9).

Commercial friction materials used in the United States for braking passenger cars and trucks contain an average composition of 50 percent chrysotile by weight (10). Asbestos has been used for brake drum linings,

disk pads, and clutch facings for the past 50 years. Jacko and DuCharme (11) estimated that the United States annually uses 103 million pounds of a brake friction materials and 4.5 million pounds of automotive clutch friction materials.

In 1968 Lynch reported that because of the friction caused by braking, almost all of the asbestos in brake linings is transformed to a nonfibrous form and a small fraction of asbestos escapes as dust (12). Jacko and co-workers determined that this country emits 158,000 pounds of asbestos annually, of which 11.2 percent is retained in the brake parts during service (13).

Brake mechanics have low and intermittent exposure to asbestos. This exposure has been reported as fiber per mil time-weighted average (fibers longer than 5 microns), with peaks up to 7 fibers per mil when parts are being cleaned (14). The standard for removing dust from brake parts is to blow it

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compressed air hose. In 170 several reports (11-18) described the levels of exposure of brake mechanics to asbestos, alternative friction materials, and specific changes in brake repair practices which would reduce the levels of exposure.

Baltimore and Washington Studies

In December 1972, the Baltimore County Department of Health mailed a 1-page mimeographed circular to about 130 establishments which provide brake repair service. These businesses included new car and truck dealerships, certified motor vehicle inspection stations, and other concerns advertising brake repair as a specialty. Some of the establishments initially contacted had either gone out of business or replied that they do not do brake repairs. The circular warned that inhalation of the dust from brake cleaning could cause serious diseases, including cancer, and advised vacuuming brakes of accumulated dust. Additional measures suggested were improved ventilation and the use of face masks (19). Two student volunteers went to 100 of the places on the mailing list 4 months later to ask shop managers what methods they were using in brake repair.

A similar study was started in Washington, D.C., in August 1973. This work was conducted by the Center for Science in the Public Interest and the District of Columbia Department of Human Resources. Of 186 brake service establishments initially contacted, 120 were followed up. Several new methods were tried in order to improve the effectiveness of the warning. The warning leaflet was more eye-catching and readable than the paragraph-form sheet used in Baltimore; the leaflets were handed out by an occupational health nurse to the mechanics themselves—none were mailed; and followup to ascertain the degree of effectiveness was conducted by the same nurse who interviewed the repair shop managers. The Washington study was also featured in a local television program at the time the leaflets were first handed out.

To assure that students trained in brake public vocational schools would learn proper health officials met with appropriate school officials in Baltimore and Washington reported schools were teaching the "blow out" method dust removal to the trainees.

The standard method of cleaning brakes is "out" with a compressed air hose. In Baltimore cent (63 per 100) of the brake repair establishments contacted were using this method at the time they received the warning circulars. In Washington figure was 91 percent (110 of 120). Most managers and workers interviewed had new about the hazardous potential of brake dust. ably, the responses ranged from annoyance to action.

Of the 65 places in Baltimore initially blowing out brakes, 11 were using either vacuum or wet methods at the time of followup. Four others blowing out brakes, but had improved ventilation provided dust masks, or both, to reduce exposures.

In Washington, only two establishments changed to wet brushing, but none were vacuuming brakes. Four others provided face masks. Inter two others decided to change brake shoes in repairs, thereby simplifying the problem removal and reducing the mechanics' exposure.

The degree of improvement, indexed by the age of establishments converting from blowing out brakes to safer techniques after a single warning, was 23 percent in Baltimore County and 7 percent in Washington. This disparity probably arises from differences in the methods of the studies and differences in the study groups.

It may be critically important to approach the problem at the outset in order to enlist the cooperation needed to implement any changes in practice. A mechanic who is approached directly with a warning may simply disregard it. The mechanic might think that if the dust were really dangerous, there would be a law requiring the use of preferred methods of repair. And the employer, if not asked to participate from the beginning, may well conclude that he will be concerned with the matter. The failure of management may be the main reason why the Washington study produced less gratifying results than the Baltimore study.

Brake warning programs consisting merely of warning notices require little manpower, compared to other health programs. Also, the effort to improve safe techniques in public vocational schools is spent.

Conclusion

Over a 7-year period ending in 1976, the standard for time-averaged exposure to asbestos has been reduced from 5 million particles per

Prevention for the Car	Don't Do It for the Car	What Are the Risks
Don't use a compressed air hose to clean your car. It can blow dust into your eyes and lungs.	Use a vacuum or wet brush to clean your car.	• Brake repair creates a lot of dust. If it gets into your eyes or lungs, it can cause serious diseases, including cancer.
Don't use a compressed air hose to clean your car. It can blow dust into your eyes and lungs.	Use a vacuum or wet brush to clean your car.	• The use of a vacuum or wet brush to clean your car can reduce the amount of dust that gets into your eyes and lungs.
Don't use a compressed air hose to clean your car. It can blow dust into your eyes and lungs.	Use a vacuum or wet brush to clean your car.	• The use of a vacuum or wet brush to clean your car can reduce the amount of dust that gets into your eyes and lungs.

BRAKE REPAIR WORK CAN BE Hazardous TO YOUR HEALTH



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microns). For asbestos textile plants, this reduction is about 15-fold (23). Present and scheduled standards claim only to protect workers against asbestosis, the disease for which the dose-response relationship is most quantitatively known. The British standards for chrysotile and amosite asbestos, which are comparable to the asbestos standard scheduled to take effect in the United States in 1976, do not purport to provide protection against increased risk of cancer (23,24).

Previously studied cohorts of asbestos workers were exposed to time-averaged concentrations greater than 2 fibers per ml (fibers longer than 5 microns). Current studies of cohorts with time-averaged exposure on the order of 1 fiber per ml (greater than 5 microns in length) may provide evidence of hazard at that level. In view of alarming preliminary findings of pulmonary fibrosis in such a cohort, the National Institute of Occupational Safety and Health has suggested to the Department of Labor that consideration be given to further lowering of the asbestos standard (25).

The average brake mechanic is not aware of the potential hazard of airborne brake dust. Nor is he quick to change time-hardened habits when warned of dangers if he cannot feel their effects. Nonetheless, substantial reduction in asbestos exposures during brake repair can be achieved by simple changes in technique, with the use of equipment already available in most brake service establishments.

In view of the tendency of the accumulating literature to reveal cancer induction from asbestos at progressively lower levels of exposure, mechanics should be advised not to blow out brake parts and to use instead methods which create less airborne dust. The manufacturers of automotive friction materials could easily attach a clear hazard warning to every item sold.

The limited success of both the Baltimore and Washington studies shows the limited efficacy of voluntary compliance with health warnings—the shop managers and the mechanics simply do not have the same regard for a warning that they have for a regulation. The margin of safety, if any, provided by the current asbestos standards has been sharply criticized as insufficient (26). While it is advisable that brake mechanics at least be warned of the potential hazard of their work, it is also apparent that blowing out brakes will be a common practice so long as health regulations permit it.

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