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ON THE

EVALUATION OF THE CARCINOGENIC RISK

OF CHEMICALS TO MAN:

Asbestos

Volume 14

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Castleman 4/29/83 42

Biles & Emerson (1968) and Cunningham & Pontefract (1971) also reported the occurrence of asbestos fibres in British, Canadian and American beer (1-6.6 million fibres/l). Asbestos fibres were found in various sherries, ports, vermouths and soft drinks (1.7-12.2 million fibres/l) (Cunningham & Pontefract, 1971).

Pharmaceuticals: Chrysotile asbestos has been found in some samples of parenteral drugs (range, 1-1000 ng/g) (Nicholson *et al.*, 1972). In the US, no asbestos-containing or other fibre-releasing filter may be used in the manufacture, processing or packaging of such products, unless it is not possible to manufacture that drug product or component without the use of such a filter (US Food and Drug Administration, 1976).

Dental practice and dental school laboratories: Asbestos-containing periodontal packs are sometimes used after gingival surgery (Infante & Lemen, 1976). In dental schools, asbestos tape is used to hold gold that is heated and then cast into moulds during dental laboratory procedures. This may be a potential problem and has not been evaluated by adequate industrial hygiene monitoring.

(b) Asbestos in the work environment

Asbestos contamination of the air can be caused by spraying of asbestos material either for fire protection or for decorative or acoustical purposes; contamination was found to be high during the application of sprayed mineral fibre (Nicholson & Pundsack, 1973). A comparison of asbestos concentrations in air under different circumstances as measured by electron microscopy is as follows: near asbestos spraying, 10-1000 ng/m^3; during a milling operation, 10-5000 ng/m^3; in other occupational exposures, 1000-> 100,000 ng/m^3 (Nicholson *et al.*, 1975).

Fibre concentrations in various asbestos-using industries in the US prior to 1971, as determined by optical and electron microscopy, are given in Table 11.

Table 11

Concentrations of fibres in various asbestos-using industries in US before 1971[a]

Industry	Range of means (fibres > 5 μm/ml)	Range of individual samples (fibres > 5 μm/ml)
Textile	0.1-29.9	0.0-143.9
Insulation	0.1-74.4	0.0-208.4
Paper packing and asphalt production	0.2-13.6	0.0-18.9
Cement shingles, millboard and gasket	0.1-4.4	0.0-16.6
Friction	0.1-14.4	0.1-32.4
Cement pipe	0.2-6.3	0.0-13.4

[a] From US Department of Health, Education & Welfare (1972b)

Airborne asbestos sampling programmes do not at present, however, attempt to discriminate between the various fibrous minerals present in dust samples. Table 12 gives a comparison of the length distributions of airborne asbestos fibres, as determined by electron microscopy, in various industries in the US.

Table 13 gives the contents of asbestos fibres, by products and fibre type, in asbestos products produced in various EEC countries.

Occupational exposure in situations other than the traditional asbestos processes (mining, milling, factory production and handling of asbestos products) has been shown to be of increasing importance. Such exposures occur during end-product use, as among asbestos insulation workers (Selikoff *et al.*, 1964), among brake repair and brake maintenance workers (Lorimer *et al.*, 1976; Rohl *et al.*, 1976, 1977), and as the result of indirect occupational exposures, particularly in ship building and ship repair (Harries, 1968, 1976), and in the construction industry. Other exposures occur in relation to inspection, repair and maintenance work on asbestos-containing structures and

Table 12

Lengths of asbestos fibres in air near various US industries [a]

Operation	Fibre type	Median length (μm)	% > 5 μm
Textile	chrysotile		
Fibre preparation & carding		1.4	4
Spinning, twisting, weaving		1.0	2
Friction	chrysotile		
Mixing		0.9	2
Finishing		0.8	2
Asbestos-cement pipe	chrysotile		
Mixing		0.9	2
Finishing		0.7	1
Pipe insulation	amosite		
Pipe forming		4.9	51

[a] From Dement *et al.* (1976)

equipment, in refineries and chemical plants, buildings, railway locomotives and wagons, shipyards and power plants. Increasingly important exposures can be expected to result from building demolition and waste disposal (US Environmental Protection Agency, 1975). These could pose a considerable problem, in view of the very large amount of asbestos now in place as the result of the cumulative use of the material during the past century. Exposures may also occur during the wearing of asbestos safety garments (Gibbs, 1975), during cleaning operations on buildings formerly sprayed with asbestos (Skidmore & Jones, 1975) and during the handling of bags formerly used in the transport and storage of raw or milled asbestos (US Department of Labor, 1975).

(c) Domestic exposure

Domestic exposure of household contacts to asbestos may occur from dusts brought home on workers' clothes, shoes, hair, equipment, etc. (Anderson *et al.*, 1976; Newhouse & Thompson, 1965; Wagner *et al.*, 1960). Nicholson *et al.* (1975) found asbestos levels ranging from 100-500 ng/m^3 in the houses of workmen.