PLAINTIFF'S EXHIBIT

CAP-1114

A/C Pipe Producers Association

Internal Correspondence

TO: Board of Directors
International Affairs Committee

FROM: J. F. Welch, Vice-President

J.F. Welch

DATE: June 20, 1984

SUBJECT: Canada Department of National Health and Welfare – Article on Asbestos

ACTION REQUIRED: Review for information

The enclosed article, "Human Exposure to Environmental Asbestos," was authored by Peter Toft and M. E. Meek of Health and Welfare Canada. It reviews the occurrence and exposure levels of asbestos in Canadian drinking water supplies and ambient air, concluding:

> Available data indicate that the risks to health associated with the ingestion of asbestos in drinking are extremely small at the concentrations commonly found in public drinking water supplies.

If you have questions, please do not hesitate to call.

JFW/bwm

Enclosure

cc: A. H. Kahn, Esq.

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HUMAN EXPOSURE TO ENVIRONMENTAL ASBESTOS

P. Toft# and M. E. Meek#

ABSTRACT

Asbestos is an important mineral in Canada which produces about 1.5 million metric tonnes annually. It is dispersed in the environment through natural erosion processes and industrial use. Concentrations in ambient air are low, ranging from non-detectable to a maximum of 97.5 fibres/L (total) in mining communities (0.02 fibres/cc longer than 5 um). Asbestos fibre concentrations in the air of buildings in Canada with friable surfaces of sprayed asbestos are not significantly higher than levels in ambient air. Ninety-five per cent of the Canadian population receives drinking water containing less than 10×10^6 fibres/L.

INTRODUCTION

Asbestos is a general term which refers to a family of naturally occurring fibrous minerals of the serpentine or amphibole groups. Asbestos minerals are widely distributed throughout the earth's crust; they include chrysotile, the only member of the serpentine group, and crocidolite, anthophyllite, tremolite, actinolite, and amosite, which are amphiboles. Current world production is estimated to be about 4.5 million metric tonnes, of which more than 95% is chrysotile -- the only type produced in Canada (ref 1). The other commercially important forms are amosite and crocidolite which are mined principally in South Africa. The U.S.S.R. is the world's largest producer, while Canada is second, producing about 1.5 million tonnes annually. Asbestos minerals possess a unique combination of properties such as fire and heat resistance, chemical resistance (particularly to acids), high tensile strength, durability and flexibility. These characteristics have led to more than 3000 commercial uses for this group of minerals, including thermal insulation materials, friction products, and heat shields for spaceships; however, about two-thirds of production is used by the construction industry in products such as asbestos cement sheet and pipe (ref 2).

Asbestos is dispersed in the environment by erosion of asbestos containing minerals and through industrial use. Natural weathering by wind and water lead to its release into the atmosphere and bodies of water. However, the principal source of asbestos in some water bodies is disposal of waste. The use of sprayed asbestos-containing insulation in buildings has caused concern about its potential release into indoor air.

Man can be exposed to asbestos in the environment through three principal routes -- air, drinking water and food. Asbestos workers receive by far the greatest exposure from their work environment; this special category is not considered in this paper which is, rather, devoted to exposure of the general public.

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ASBESTOS IN AMBIENT AIR

Optical microscopy is inappropriate for the analysis of asbestos in ambient air due to the poor limit of resolution of the method. In fact, only about 0.3% of the total airborne asbestos fibres present in the general environment can be detected by phase contrast optical microscopy (ref 3). In addition, asbestos fibres cannot be distinguished from other inorganic and organic fibres by this method of analysis and non-asbestos fibres may constitute up to 90% of the total fibre content of ambient air. Transmission electron microscopy (T.E.M.) is, therefore, the method of choice for the analysis of asbestos in ambient air. However, it is often difficult to make meaningful comparisons of airborne fibre levels determined by T.E.M. due to the variations in procedures for sample preparation and analysis used in different laboratories. In addition, results are sometimes reported in terms of numbers of fibres and sometimes in terms of mass concentrations. The following discussion is restricted to asbestos levels determined by the most accepted method of sample preparation involving direct transfer techniques. Data obtained by this method are generally reported as fibre concentrations which are more relevant for health hazard assessment purposes. Asbestos levels in the air of asbestos mining towns in Quebec have been determined since the introduction in 1977 of an emission regulation for asbestos mining and milling operations. Samples were collected in June 1983 at 11 sites in five mining communities located downwind from asbestos mines. Sampling was also conducted at a control site in Sherbrooke, Quebec. The overall mean asbestos concentrations in the samples from the mining towns was 47.2 fibres/L (total) and 7.8 fibres/L (>5 um). Mean values for each of the sites sampled ranged up to 97.5 fibres/L (total) and 20.6 fibres/L (>5 um). For the control community, the mean values were lower — 14.7 fibres/L (total) and 0.7 fibres/L (>5 um) (ref 4).

Data are also available on levels of asbestos present in ambient air in some Canadian cities and rural areas remote from asbestos mining activities. For example, concentrations at 12 locations in Metropolitan Toronto during 1980-81 ranged up to 45 fibres/L, of which, several fibres (2-9) had lengths greater than 5 um (ref 3). Airborne levels in three other smaller cities in Southern Ontario ranged from 0 to 14 fibres/L (total) and 0 to 11 fibres/L (>5 um long). Concentrations at a remote rural location near Bracebridge, Ontario, were all below the detection limit of the analytical method (2 fibres/L).

Recently, concern has been expressed about potential exposure to asbestos in the air of public buildings with friable surfaces of sprayed asbestos-containing insulation. Sprayed asbestos was used extensively between 1946 and 1973 on structural surfaces (to retard collapse during fire) and on ceilings (for purposes of acoustic and thermal insulation and decoration). In Canada, the use of sprayed asbestos-containing materials was eliminated in the early 1970's due to increasing awareness of the potential risks to health of workers associated with the application process. A number of studies of airborne asbestos levels in buildings containing friable asbestos-containing insulation in Quebec and Ontario have been reported. In general, the fibre concentrations in such buildings were not significantly higher than those in ambient air (ref 3). For example, in a large building insulated with a friable mixture of chrysotile and mineral wool, no values above 17 fibres/L were found and levels were below the detection limit (approximately 3 fibres/L) in 12 of the 15 samples.

The fibres in the majority of the asbestos-containing construction materials and consumer products found in homes are effectively bound solid matrix and are not expected to be released under conditions of normal use. There is evidence, however, that fibre levels determined optical microscopy are elevated significantly during sanding, grinding, cutting or other processes used in installation or alteration of asbestos-containing construction materials (ref 5). Regulations have been introduced under the Hazardous Products Act in Canada to prohibit the use of asbestos in wall joint cements and wall patching compounds.

Prior to 1979, asbestos liners were used in some hand-held hairdryers to protect the barrel from heat. Analysis for asbestos in ambient air resulting from the operation of 16 brands of asbestos-containing hairdryers commercially available in Canada indicated that concentrations in a 1 cubic metre test chamber after operation of the hairdryers for 30 minutes were at or near the limit of sensitivity of the T.E.M. method of analysis (20 fibres/L) (ref 6). These concentrations were similar to those obtained with asbestos-free hair-dryers. However, because of public concern, manufacturers voluntarily replaced the asbestos liners in hairdryers and, in 1979, a new standard was issued by the Canadian Standards Association which specified elimination of asbestos from all electrical hairdressing equipment.

It has been suggested that asbestos fibres in tap water could become airborne as a result of home humidification. However, the transfer of chrysotile fibres from water to air via home humidification using a conventional drum-type home humidifier in a laboratory study was found to be negligible even when the concentration of asbestos in the water was as high as 400 million fibres/L (ref 7).

ASBESTOS IN DRINKING WATER SUPPLIES

The majority of fibres found in water supplies are well below the size range that is normally detected optically -- typically less than 1 μm. The method of choice for the analysis of drinking water samples, therefore, employs the electron microscope, and preferably the transmission electron microscope (ref 8).

Information on asbestos concentration in Canadian public water supplies is available from a national survey conducted in 1977 (ref 9). Samples were collected from water supplies serving about 55% of the population at 71 locations across Canada. Analyses were performed by transmission electron microscopy using the U.S. E.P.A. interim procedure (ref 10).

The results showed that 25 sites had concentrations of chrysotile in drinking water greater than 5×10^6 fibres/L. Values ranged up to 1800×10^6 fibres/L. In general, the median fibre lengths observed were between 0.5 and 0.8 um. In some locations, very long fibres (up to 50 um) were also observed, but these did not constitute the majority of fibres present.

The results also showed that amphibole asbestos is not a significant contaminant of Canadian drinking water supplies. Only 7% of the 336 samples had detectable levels of amphibole fibres, and the higher values were usually associated with high chrysotile levels.

It is possible to draw some conclusions regarding the extent of exposure of Canadians to asbestos in drinking water by weighting these drinking water results with population data. When presented in this way, it appears that the fibre concentration in drinking water supplies versus population is approximately logarithmico-normally distributed. 95% of the population receive water containing less than 10 x 10^6 fibres/L. About 0.6% of the population receive water containing more than 100 x 10^6 fibres/L.

Surveys of asbestos in drinking water have also been conducted in other countries. Commins (ref 11) has reported that asbestos concentrations in British drinking water supplies range up to 2.2 x 10^6 fibres/L, and Millette (ref 12) has published a compendium of surveys carried out in the United States showing ranges of 1 to 100 x 10^6 fibres/L.

CONCLUSION

Available data indicate that the risks to health associated with the ingestion of asbestos in drinking water are extremely small at the concentrations commonly found in public drinking water supplies (ref 8). It is well recognized, however, that inhalation of asbestos fibres potentially presents a more significant hazard to health. Although asbestos is ubiquitous in the environment, concentrations in ambient air are low and only slightly elevated in the air of asbestos mining communities — generally less than 1% of the occupational standard. Strategies to limit the exposure of the general public have, therefore, appropriately been directed towards controlling industrial emissions and restricting the use of asbestos in products which can lead to the release of fibres into the air.

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