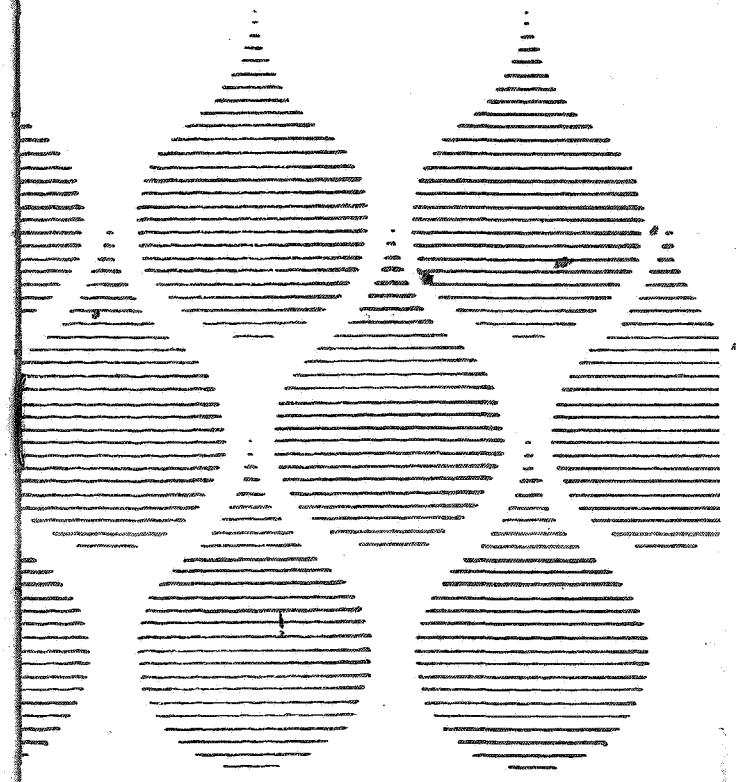
Asbestos in Water

A hazard to health?



I. Introduction

Inhalation of large quantities of airborne asbestos fiber in occupational settings is known to increase the risk of respiratory disease and certain cancers among industrial, construction and shipyard workers. There is also an indication of increased incidence of gastrointestinal (GI) cancer among such workers. These findings have led to speculation that the general public is subject to a health risk from the asbestos fiber which can be found in water.

This pamphlet sorts out the different issues connected with the concern about asbestos and water, and presents the more recent comments of the U.S. and international public health community on this topic.

II. Sources of Asbestos in Water

Asbestos is found in water supplies everywhere. The three principal sources of the asbestos fibers are natural contamination from erosion of asbestos mineral deposits, effluent discharges from industry, and use of asbestos cement pipe water distribution systems.

In water, wide-ranging concentrations of asbestos have been reported. Concentrations in the U.S. in excess of 10 million fibers per liter are uncommon. Consistently, the highest water concentrations result from natural contamination. Raw waters, generally, contain higher concentrations of asbestos and those levels become reduced due to the normal water treatment given to drinking water supplies.

Most water samples taken in different surveys of 406 U.S. cities found less than one million fibers of all sizes per liter; about 10 percent between one and 10 million fibers; and, another 10 percent more than 10 million.[1]

Very exacting analysis, transmission electron microscopy coupled with selected area diffraction, is required to identify asbestos particles in water.

III. Asbestos Serves the World

Asbestos fibers have long been used by man. Today, asbestos has many important technological applications in our modern society.

Asbestos, a generic term, describes a number of naturally occurring fibrous minerals located in various concentrations across the earth's surface. As generally recognized, the term encompasses six minerals: chrysotile, amosite, crocidolite and fibrous forms of tremolite, anthophyllite and actinolite.

Asbestos has found its way into preferred use because of its high tensile strength, superior flexibility and durability, favorable friction properties, and resistance to fire, heat and corrosion. This unique combination of properties remains unmatched by any other fiber, natural or man-made.

In recent times, certain asbestos uses have been phased out. Asbestos continues to be used in products in which the asbestos fibers can be "locked-in" by binders, such as cement, resins and plastics. Such products can be safely used without significant fiber release.

In 1986, U.S. consumption was 112,000 tons of asbestos. Estimates of world production total over four million tons, with the USSR and Canada continuing to be the leading miners.

IV. Asbestos Exposure and GI Cancer

Speculation and public concern has been frequently voiced about the possible hazards from ingestion of asbestos fibers commonly found in drinking water. The concern arises from the increased number of gastro-intestinal cancers (GI) identified among persons exposed to airborne asbestos in some occupational settings. The large body of evidence now in existence is, however, generally agreed to support this assessment of asbestos in water: "the suggested risks have never been conclusively confirmed, the issue very probably [is] a non-problem."[2]

One of the most important recent findings is that despite numerous animal feeding studies, at least a dozen which used a total of 10,000 animals with some being fed massive doses of asbestos, none indicates that ingested asbestos is carcinogenic.[3] One of the several National Toxicology Program animal feeding studies reported in 1984, was interpreted by NTP as showing "some evidence" of carcinogenicity in exposed male rats. However, the U.S. Environmental Protection Agency's Science Advisory Board has since disagreed with the NTP conclusion, interpreting the evidence as 'equivocal', and has reaffirmed in its 1985 review a previously reached conclusion, notably that:

> the current peer-reviewed evidence for humans and animals does not support the view that asbestos ingested in water causes organ-specific cancers.[4]

In view of all these studies, prevailing international scientific opinion is that the public health risk associated with waterborne asbestos is sensibly zero.

Consistent with that opinion is the view of the World Health Organization. WHO drinking water guidelines

discuss in detail the potential risks of asbestos, but conclude that no guideline value for the substance is necessary.[5] In a 1985 letter by its Director of Environmental Health Service, WHO reviewed the new data reported since original publication of the guidelines and concluded:

> it would, therefore, appear from such scientific work which has been published since 1981, that the general consensus is that imbibed asbestos via drinking water supplies poses no assessable risk to the health of the consumer.[6]

Also, the Royal Commission on Matters of Health and Safety Arising from the Use of Asbestos in Ontario, Canada published in 1984 an extensive review on all aspects of asbestos risk. The Commission found that some Ontario water supplies contain up to 22 million asbestos fibers per liter but concluded such concentrations are not a public health concern:

> The fibers are almost invariably extremely short, that is, below one micron in length. The small dimension of these fibers coupled with our finding that asbestos disease is occasioned by inhalation rather than ingestion, leads us to conclude that asbestos in drinking water is not a health hazard.[7]

V. Asbestos Cement Pipe

Asbestos in clay was the first composite building material used by man, 4000 years ago. Much later, asbestos combined with cement became the first industrially-recognized fiber-cement material, and was commercially developed into pipe and other products.[8]

Since its invention at the turn of the century, asbestos cement high- and low- pressure pipes have been used for drinking water distribution, sewage, drainage and irrigation systems. At least 1.5 million miles of A/C pipe have been installed worldwide. A/C pipe was introduced in the U.S. in 1929, and current estimates of total use in the country exceed 400,000 miles,[9] in systems that serve at least 26 million people.[10]

One reason for the presence of asbestos fibers in drinking water may be related to the method of distribution, i.e. A/C pipe. The issue of fiber release from A/C pipe continues to be closely examined by a number of U.S. and international public health organizations. Highly corrosive water, e.g. soft water with a low ph, is much more likely to attack the cement matrix than are neutral and alkaline waters. Consequently, A/C pipe manufacturers do not recommend their products be used where water is highly aggressive.

It is highly unlikely that fiber release from A/C pipe causes exposure exceeding that which would occur from drinking water from areas geologically-rich in asbestos, i.e. the California Bay and Puget Sound areas.[11]

Commenting on the issue, a U.S. Environmental Protection Agency water quality official in 1983 pointed out, "If the source of asbestos in drinking water is [A/C] pipe then there is more than sufficient economic reason to correct the corrosive action of the water on the pipe."[12] In other words, good water treatment by a community is one of the best ways to preserve the integrity of A/C pipe.

More recently, a 1986 World Health Organization memorandum noted, "Generally, it has been concluded that the concentration of asbestos in drinking water resulting from the use of [A/C] pipe does not present a hazard to human health"[13]

VI. Asbestos Filters

Often asbestos has been utilized as a component in paper filtering materials which are used by food and drug industries. The asbestos fibers are an ideal filtering material because they combine a high surface area with high permeability and enable the efficient clarifying and/or sterilizing of beverages and drugs.

Typical beverages which may be filtered through asbestos include: beer, wine, liquor and soft drinks.[14]

Using asbestos to filter liquids has led to the supposition that perhaps some fibers can be released during the process, and pose a health concern for consumers. The presence of asbestos in different beverages has been repeatedly discovered by researchers. However, argument persists over whether the fibers' origin is shedding from filter material or comes from along with the natural water used to make the beverages. Whichever, manufacturers now add, as a standard practice, a non-asbestos trap filter at the end of their process lines.

The 1984, the Report of the Royal Commission on Matters of Health and Safety Arising from the Use of Asbestos in Ontario responded to this issue:

> . . . in view of the fact that asbestos fiber levels in filtrate do not appear to be significantly higher than levels in drinking water, we see

no need for new legislation which would specifically limit the level. . .[15]

VII. U.S. Government Action

—In 1974 and 1975, the Environmental Protection Agency promulgated a set of national waste water effluent standards for asbestos manufacturing operations to control the discharge of asbestos-bearing waste to waterways and publicly-owned treatment works.[17]

—In 1975, the Food and Drug Administration formalized a regulation that restricts the use of asbestos fibers in the manufacture of parenteral drugs for humans. At the same time, FDA reaffirmed an earlier position, that limits on asbestos filters in preparation of foods and non-parenteral drugs is uncalled for by current, available data.[18]

—In 1985, the EPA proposed setting a recommended maximum containment level for asbestos in drinking water at 7.1 million long fibers (greater than 10 microns) per liter. The rulemaking is pending.[19] If the level becomes a final rule as proposed, almost all, if not all U.S. drinking water will already be in compliance as such concentrations are rarely monitored.

—In 1986, the EPA proposed a ban of asbestos cement pipe, basing its arguments on estimated airborne asbestos fiber exposures in pipe manufacture and installation, not on ingestion risk.[20]

VIII. Conclusion

Asbestos exists on the earth's surface throughout the world and is naturally released into water by erosion. For a very long time this natural level of asbestos has been making its way into everyone's drinking water. However, the actual risk associated with the drinking of asbestos in small amounts has not been identified by public health officials as significant.

Asbestos cement pipe is widely recognized as cost-effective, reliable, and safe as any water pipe in common use today. In non-aggressive waters, field measurements have confirmed laboratory results that A/C pipe does not contribute significant or in many cases even measureable amounts of asbestos to drinking water carried through it. For aggressive waters, water stabilization is considered a positive step towards reducing the possibility of significant amounts of fiber release.

As of mid-1987, the U.S. Environmental Protection Agency proposal to ban the use of A/C pipe was still pending. Strong arguments from industry including several representatives of third world countries where the lack of potable water poses serious health problems, had been presented to EPA against the ban and the Agency was still reconsidering the matter.

IX. References

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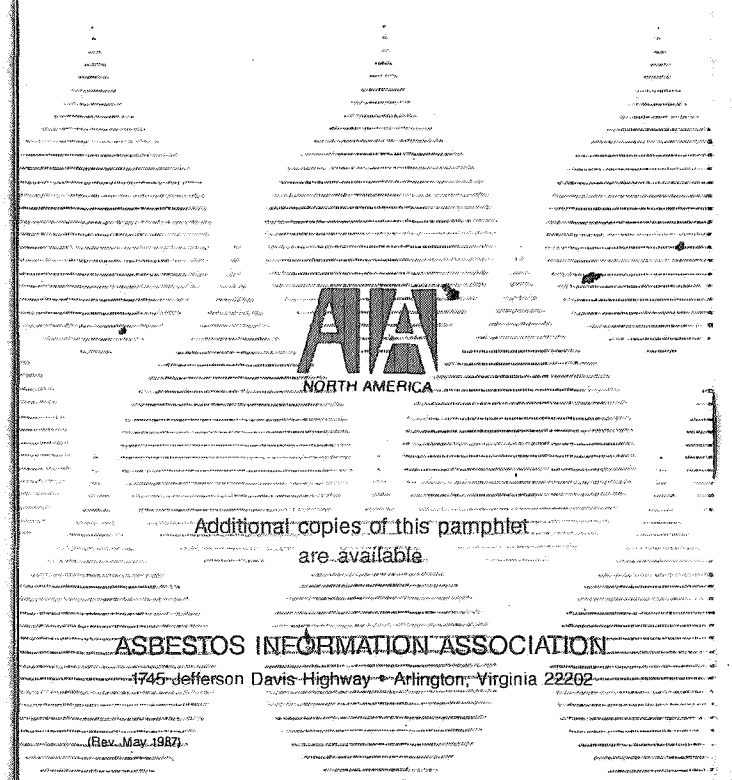

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ASBESTOS INFORMATION ASSOCIATION
1745 Jefferson Davis Highway • Arlington, Virginia 22202

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