Asbestos-Cement Water Pipe and Health

SUMMARY:
Questions have been raised about a possible health hazard associated with drinking water that has passed through asbestos-cement pipe.

The Public Health Service's position that there is a low probability of any health hazard associated with the use of A/C pipe is supported by prominent medical authorities. Additionally, the Advisory Committee on Asbestos Cancers of the IARC reports there is no indication of any increased cancer risk from asbestos fibers present in water, beverages, food, or in the fluids used to administer drugs.

Four types of evidence support the position that A/C pipe poses no health hazard: 1. Experiments have not shown any relationship between GI cancer and heavy concentrations of asbestos dust in the air or dust on food; 2. Large quantities of asbestos fiber fed to animals have not produced GI cancer; 3. There is no evidence to support the contention that A/C pipe releases asbestos fiber into water in amounts that can constitute a public health hazard; and 4. There has been a decrease, rather than an increase, in the incidence of GI cancer during the very years that the use of A/C pipe has increased in the U.S.

ASBESTOS-CEMENT DEFINED

Asbestos-cement (A/C) pipe for water supply and waste disposal systems was developed in Europe in 1913 and introduced to the United States in 1929. Asbestos fiber, added to Portland cement and silica, provides the structural strength required for durable, lightweight, rustproof, economical piping. Despite extensive research and experimentation, no satisfactory substitute for asbestos has ever been found as a replacement in asbestos-cement products.

These advantages have led to the use of great quantities of asbestos-cement pipe over the past half century, for water supply and sewer systems, irrigation projects, drainage systems, industrial processes, heating and cooling installations, and as conduit for electrical and telephone wires.

For water supply systems, A/C pipe meets the specifications of the American Water Works Association and of the U.S. Government. Under Federal Specification SS-P-351C, asbestos-cement water pipe is sold to the U.S. Public Health Service.

Because of the recognized occupational health hazards connected with the excessive and prolonged inhalation of asbestos dust, the question has been raised as to whether there might be a possible health hazard associated with drinking water that has passed through asbestos-cement pipe.

A QUESTION OF HEALTH

In late 1967, the U.S. Public Health Service was asked to look into this question, especially as it might be related to the risk of gastrointestinal (GI) cancer. Public Health Service officials discussed the matter with two prominent medical authorities in the field of asbestos and health. They were *Dr. George W. Wright,* Chairman of the Scientific Advisory Committee of the Institute for Occupational and Environmental Health, and head of the Medical Research Department, St. Luke's Hospital, Cleveland; and *Dr. Irving J. Selikoff,* Professor and Chairman, Division of Environmental Medicine, Mount Sinai School of Medicine, New York City.

Both *Dr. Wright* and *Dr. Selikoff* confirmed the Public Health Service's position **"that there is a low probability of any health hazard associated with the use of asbestos-cement pipe."**

Dr. Wright's position is summed up as:
"To my knowledge, there have been no reports in medical literature of a relationship between gastrointestinal (GI) cancer and the drinking of water supplied through an asbestos-cement pipe water system. There is no evidence that the ingestion of one, or a hundred, or a thousand asbestos fibers on one or more instances, is related to gastrointestinal cancer."

Johns-Manville, Environmental Facts: Asbestos-Cement Water Pipe and Health (1973)
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Dr. Selikoff's view is:
There is "no evidence at all at this time that the presumably very low level exposure by ingestion which might occur by intake of water supplied through asbestos-cement pipe has resulted in a recognized health hazard."

The Advisory Committee on Asbestos Cancers in its report to the Director of the International Agency for Research on Cancer, prepared October 6, 1972, considers the question: "Is there evidence of an increased risk of cancer resulting from asbestos fibers present in water, beverages, food or in the fluids used for the administration of drugs?" Their answer: *"Such evidence as there is does not indicate any risk."*

FOUR TYPES OF EVIDENCE SUPPORT POSITION

Four types of evidence support the position that A/C pipe poses no hazard:

1. Exposure of laboratory test animals to heavy concentrations of airborne asbestos dust, much of which was swallowed, has resulted in no observed cases of gastrointestinal cancer.

2. Experiments in which laboratory animals were deliberately fed a heavy dose of asbestos dust mixed with the regular food produced no tumors in animals.

3. Recent research indicates that only infinitesimal amounts of asbestos are released into drinking water that goes through asbestos-cement pipe.

4. In the face of the ever-increasing use of asbestos-cement pipe and of asbestos fiber, the death rate from gastrointestinal cancer in the United States has shown a steady *decline* over the last 20 years. This national trend also applies, in general, to those cities where A/C pipe has been used in water systems for long periods of time. Similarly, in European countries where A/C pipe has been used extensively (in many countries for more than half a century) the death rate from this type of cancer has also declined.

FURTHER DETAILS ON TYPES OF EVIDENCE

1. Animal experiments with airborne asbestos have not produced GI cancer.

Laboratory test animals are used extensively in cancer research to study their reactions to various substances that are suspected of having some relationship to cancer in humans. Tests of this nature, using asbestos dust in heavy concentrations in inhalation chambers, have been conducted on mice for as long as two years and on dogs for four or more years. The amount of fiber not only inhaled, but also swallowed, by these experimental animals is far in excess of any comparable human exposures.

Dr. Wright points out that in inhalation experiments, "the food, especially of the small animals, is covered by the settled-out asbestos fibers in the experimental chambers."

Inhalation experiments of this type have been conducted for many years in many laboratories *without a single report of GI cancer.* Dr. Arthur Vorwald and associates at the Saranac Laboratory of the Trudeau Foundation have issued two reports covering more than twenty years of investigation. Dr. J. C. Wagner conducted similar animal inhalation experiments in South Africa and in Britain. Neither Vorwald nor Wagner ever noted GI cancer in any animal.

In addition, experiments conducted by Dr. Selikoff on hamsters generally support the dog-and-mice findings.

"Yet," Dr. Selikoff commented, "the exposure to ingested asbestos in this experimental work was very much larger indeed than might be anticipated in water obtained from asbestos-cement pipes."

Summary: Animal inhalation experiments show no relationship between GI cancer and heavy concentrations of asbestos dust in the air, or the fallout of the dust on food.

2. Direct feeding of asbestos dust to experimental animals has failed to produce GI cancer.

In 1968 the British doctors, Bonser and Clayson, reported an experiment in which 40 rats were maintained on a diet which included approximately 2 grams of asbestos per week. No tumors of any kind resulted, they said, adding "nor were there any lesions in the intestinal wall which might have suggested a previous absorption of asbestos fibers."

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Summary: Asbestos fibers, fed to animals in measured large quantities, have not produced GI cancer.

3. Municipal Water and Asbestos

A study was recently conducted of the drinking water in nine cities that have used asbestos-cement pipe for periods ranging from 8 to 17 years. *Not one of the water samples, either before or after passing through A/C pipe, contained fibers which were visible under a light microscope.* Only through use of the electron microscope was it possible to detect minute fibers of asbestos in any of the water samples. It is worthy of note that *all samples contained some asbestos fiber before passing through A/C pipe,* and in many cases the infinitesimal amount of fiber was essentially the same before and after exposure to the pipe.

One possible explanation for this is that natural waters, flowing through rock formations underground or through streams, appear to pick up trace amounts of asbestos, along with other minerals and naturally occurring chemicals. Thus, people for generations probably have been swallowing tiny amounts of asbestos in the water they drink.

The highest asbestos content per gallon of water tested was 6 micrograms, about one five-millionths of an ounce. In terms of human consumption this means that if a man were to drink eight glasses of water per day, he might swallow a total of twenty-seven ten-thousandths of an ounce (.0027) of asbestos in a lifetime of 70 years.

Summary: Present evidence does not support the contention that asbestos-cement water pipe releases asbestos into water in amounts that can constitute a health hazard to the general public.

4. Decrease in frequency of GI cancer in the United States.

Figures from both the National Office of Vital Statistics of the United States Public Health Service and from the American Cancer Society show a steady decline in the frequency of GI cancer in the United States from 1947 to 1966. The death rate per 100,000 of population from GI cancer dropped from 55.2 in 1947 to 48.4 in 1966. Available United States figures also show GI cancer declining since 1960 as a percentage of total deaths.

TABLE I

DEATHS FROM SELECTED CAUSES FOR THE UNITED STATES

YEAR	TOTAL DEATHS ALL CAUSES	DEATHS FROM GI CANCER	GI CANCER AS % OF ALL DEATHS
1960	1,711,982	91,035	5.3
1962	1,756,720	92,047	5.2
1964	1,798,061	93,158	5.1
1966	1,863,149	95,079	5.1
1970	1,921,000	94,640	4.9

Similar trends can be found in cities all across the country.* Take for example the comparison between Nashville, Tennessee, where no A/C pipe has been used and Knoxville, Tennessee, where A/C pipe has been used since 1938—over 30 years. Here's how United States government figures apply to those two cities.

TABLE II

NASHVILLE-KNOXVILLE COMPARISON

	NASHVILLE (NO A/C PIPE)		KNOXVILLE (A/C PIPE SINCE 1938)	
	1960	**1966**	**1960**	**1966**
Deaths from All Causes	3,675	3,901	3,038	3,360
Deaths from GI Cancer	129	185	131	153
GI Cancer Deaths As Percent of Total	3.5%	4.7%	4.3%	4.5%

*In considering these figures, it is important to remember (a) that cities tend to have higher rates of cancer than rural areas, so some city figures will run higher than the U.S. average, and (b) that minor fluctuations from year to year in the percentage figures, whether up or down, are of little or no significance, especially if the numbers are small.

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Similarly, in Europe, where asbestos-cement pipe has been in use for fifty years or more, the death rate from GI cancer is generally downward. For example, in Switzerland, where the use of A/C pipe is the highest per capita of any Western European country, the death rate for GI cancer has dropped from 81.9 per 100,000 of population in 1951 to 63.9 in 1962, according to the latest figures available from the World Health Organization.

Thus the actual frequency of gastrointestinal cancer does not support any suggestion that the use of asbestos-cement water pipe is causing an increase in this type of disease. In fact, *during the very years that the use of A/C pipe has increased in the United States, the rate of GI cancer has declined.* It is clear that no causal connection has been demonstrated between the use of A/C water pipe and GI cancer in human beings.

Summary: "Substantial and increasing amounts of asbestos fiber have been used in various ways from 1930 on in the United States, and one would anticipate that if this fiber was playing a role in the causation of gastrointestinal tumors, it might be expected to have led to an increase in tumors, rather than the observed decrease." (Dr. George W. Wright)

AN OVERVIEW

Four types of evidence have been examined: (1) results of experiments with test animals exposed to large quantities of inhaled and swallowed asbestos particles; (2) results of experiments in which animals were fed measured large quantities of asbestos; (3) results of tests to determine the amount of asbestos in municipal water supplies; and (4) the frequency of GI cancer in the United States and Europe, including those areas using asbestos-cement water pipe.

All of this evidence goes against suggestions that the use of A/C water pipe has any influence on the development of GI cancer.

Finally, it is important to view this situation in its proper perspective.

Asbestos is by no means unique in being investigated as a possible health hazard. Literally hundreds of substances—as common and everyday as fuel oil, charcoal broiled steaks, iron rust, and egg yolks—are known to be, or suspected of being, cancer-causing agents to test animals under certain experimental conditions.

Nearly everything we use and create in our increasingly complex society has been suspected, by someone, of being a potential hazard.

To forego the many benefits of these products of modern technology, simply on the basis of suspicions that are unsupported by medical proof, would be unwarranted.

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