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ECOLOGY-POLLUTION ASPECTS OF CHLOR-ALKALI PLANTS:
ASBESTOS AND HEALTH

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Asbestos is a generic term which includes a variety of fibrous minerals. It has been used in Finland as long as 4500 years ago as a binder in pottery. It was not, however, until the last 100 years that asbestos came into significant commercial use. There are, at present, at least 3000 uses for asbestos.

Types of Asbestos

There are five main varieties of asbestos which fit into two separate types, according to their crystalline structure. The two types are serpentine asbestos, of which chrysotile is the only variety, and amphibole asbestos of which there are amosite, crocidolite, anthophyllite and tremolite. The most commonly used is chrysotile.

The different asbestos fibers vary chemically depending on the source, and contain many associated impurities, both organic and inorganic. All types are associated with various trace metals.

It would be realistic to assume that even the same type coming from different sources will show some variation in biologic activity. There is some evidence to this effect, but it is not conclusive. Therefore, at present, we must assume the same hazard for all varieties.

Health Hazards

The recognition of some of the more serious hazards associated with the inhalation of asbestos dust is relatively recent and, in some quarters, not adequately understood.

Asbestosis, the first recognized disease associated with the inhalation of asbestos dust, is a scarring disease of the lung which often leads to early death. Though asbestosis still occurs, it has to a large extent been controlled where adequate industrial hygiene standards have been followed.

More recently, it has been recognized that individuals with asbestosis have an increased frequency of lung cancer. It has also been shown that there is a statistical increase in lung cancer in individuals exposed to lower amounts of asbestos dust which are not enough to produce asbestosis. Other abnormalities associated with asbestos exposure are cancer of the gastrointestinal tract, and cancer of the linings of the lung and abdominal cavities.

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Table I shows the results of a study of asbestos insulation workers. No studies are available of asbestos workers in the chlor-alkali industry, but the results of studies of other workers indicate that we must be careful to not over-expose any individual to asbestos dust.

TABLE I

Deaths Among 632 Asbestos Insulation Workers
Observed Prospectively January 1, 1943 To
April 30, 1967^{1,2}

Cause of Death	Number Of Deaths	
	Expected	Observed
Cancer Of The Lung	8.9	66
Cancer Of Lining Of Lung Cavity	0.0	6
Cancer Of Lining Of The Abdominal Cavity	0.0	8
Cancer Of The Gastrointestinal Tract	11.2	37
All Other Cancers	25.0	27
Asbestosis	0.0	27
All Other Causes	205.9	178
Total Deaths - All Causes	251.0	349

¹Selikoff, I. J., Churg, J., and Hammond, E.C.,
JAMA, 188:22, 1964

²Selikoff, I. J., Hammond, E. C., and Churg, J.,
JAMA, 204:106, 1968

The cancers occurring after over-exposure to asbestos dust were slow in being recognized because of a lapse period of 20 to 40 years between the beginning of asbestos exposure and the onset of the disease.

Table II indicates the effect of regular cigarette smoking in contributing to the development of lung cancer. The individual who is over-exposed to asbestos dust and regularly smokes cigarettes is far more likely to develop lung cancer.

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TABLE II

Lung Cancer Deaths Among 370 Asbestos Insulation
Workers January 1, 1963 to April 30, 1970

	Number Of Workmen	Lung Cancers	Lung Cancer Deaths
No History Of Cigarette Smoking	87	1	1
History Of Regular Cigarette Smoking	283	38	33

It is estimated that the individual who is over-exposed to asbestos dust and also smokes cigarettes is 90 times more likely to develop lung cancer than an individual not exposed to either of these factors.

Control Methods

If we are to avoid the consequences to the workman of over-exposure to asbestos dust, we must control his exposure. Control methods should be such that they also eliminate any hazard to fellow workers and prevent contamination of the community atmosphere. Table III lists some methods of controlling asbestos-containing dusts in different processes.

TABLE III

Methods Of Controlling Dust Containing Asbestos Fiber

1. Wetting Down With Water
 - Mixing
 - Crushing
 - Certain Textile Operations
 - Demolition
2. Dust Collecting Equipment
 - Cyclones - Multiclones
 - Wet Collectors - Low And High Efficiency Scrubbers
 - Electrostatic Precipitator
 - Bag Houses
 - Other Methods - Settling Chambers, Filters
 - Construction Controls - Saw Pickup, Dust Containment

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3. Modification Of Product Or Packaging
 - Change In Formulation
 - Substitution With Less Hazardous Materials
 - Modification Of Material Handling
 - Modification Of Production Line
 - Asbestos In Plastic Bags (Can be wetted before unloading.)
4. Respiratory Protection--If Asbestos-Containing Dust Cannot Be Controlled. (Use only approved respiratory protective devices.)

Medical control methods are of secondary importance to engineering control methods since, by the time a health problem is apparent, it is frequently too late for satisfactory treatment.

Among medical control methods are programs to discourage cigarette smoking by asbestos workers and periodic exams to discover early evidence of disease.

Community Air Pollution

There has been considerable alarm about asbestos exposure of the general population. Some local governments have already established regulations controlling asbestos contamination of the community atmosphere. It is expected that Federal criteria on airborne asbestos will be developed soon.

Not all investigators agree that there is reason for alarm. However, prudence should prompt us to avoid contaminating the community air before we find ourselves in the midst of another environmental crisis.

(The tables and much of the material used in this presentation were obtained by the author while attending the course on Asbestosis given by The Mount Sinai School of Medicine in June 1970. The help of all those presenting the course is gratefully acknowledged.)

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