Indiana State School Asbestos Program: A Status Report

Timothy A. Berg, Virgil J. Konopinski, Livia A. Laurenzano, and David L. Peterson
Indiana State Board of Health, Indianapolis, Indiana 46206

Introduction

Asbestos, the fibrous mineral silicate, has been known in its various forms and used for many purposes since prehistoric times. Establishment of its pathogenicity began in earnest in the 1920s and progressed until, throughout the 1960s and 1970s, the evidence of the correlation of asbestos with serious pulmonary diseases was assembled and given sufficient credibility to be convincing (5).

In addition to OSHA's concern about asbestos use in industry and the associated disease processes, the EPA became concerned with the disease causing potential of intermittent, low level exposures such as would occur in school buildings from asbestos containing materials. In this regard, the EPA has issued guidance outlines to school personnel to assist in establishing an asbestos control program (1). However, no federal funds have been available for sampling or analysis. The Indiana State Board of Health's Industrial Hygiene Division initiated a cooperative program with local health departments to determine the extent to which asbestos had been used in constructing Indiana schools.

Methods and Materials

Bulk samples of suspect materials were collected from schools in 92 counties by local sanitarians and sent to our lab. Samples were loaded into vials and test tubes in the hood for microscopic and x-ray analysis.

Polarized light microscopy (PLM) using dispersion staining was the primary identification technique. X-ray diffraction (XRD) analysis was used as a corroborative technique for determining the presence of asbestos. The theory and application of both analytical methods are well covered in the available references and will not be addressed in this limited space (4,7). Analyses were performed to determine qualitative asbestos content of bulk samples. In the case of XRD, the sample diffractograms were compared to standards generated by known asbestos samples (2).

The two methods of analysis complement one another. Unlike PLM, the x-ray cannot distinguish between fibrous and non-fibrous asbestiform minerals, the fibrous forms being of chief interest in the genesis of disease; and unlike XRD, the PLM is limited by size of fibers, which must be at least 0.5 microns in the smallest dimension (6). Figure 1 is a representative diffractogram of pure chrysotile asbestos mineral, the most prevalent form encountered in our survey. Figure 2 is a representative diffractogram of pure amosite asbestos, which is second in the quantity used commercially, and considered to be the more toxic of the two (9).

Results and Discussion

The Indiana counties that actively participated in our survey and the number of facilities sampled are listed in Table I. To date, 74 health departments have participated and 988 public buildings have been surveyed. The number of samples submitted ranged from a low of one per county to a high of 189. The variation in number of samples submitted was attributed to the personnel available and/or the

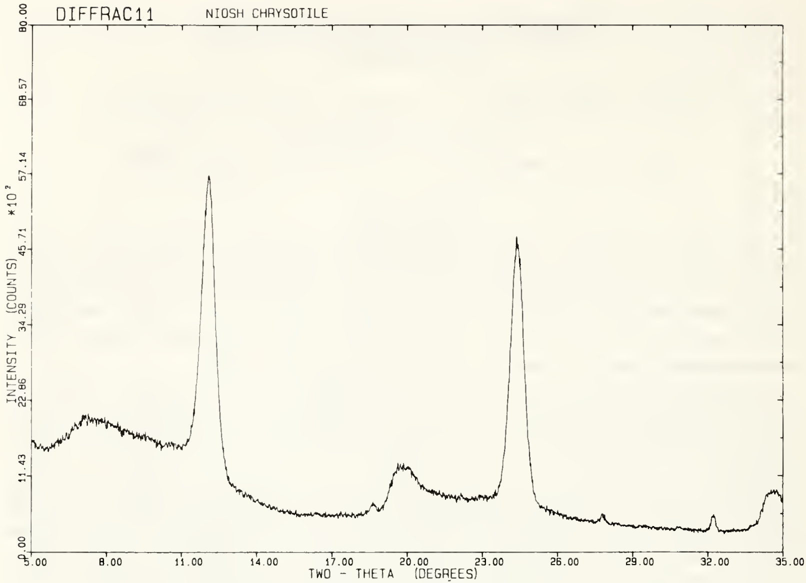

FIGURE 1. *Diffractogram of pure Chrysotile Asbestos*

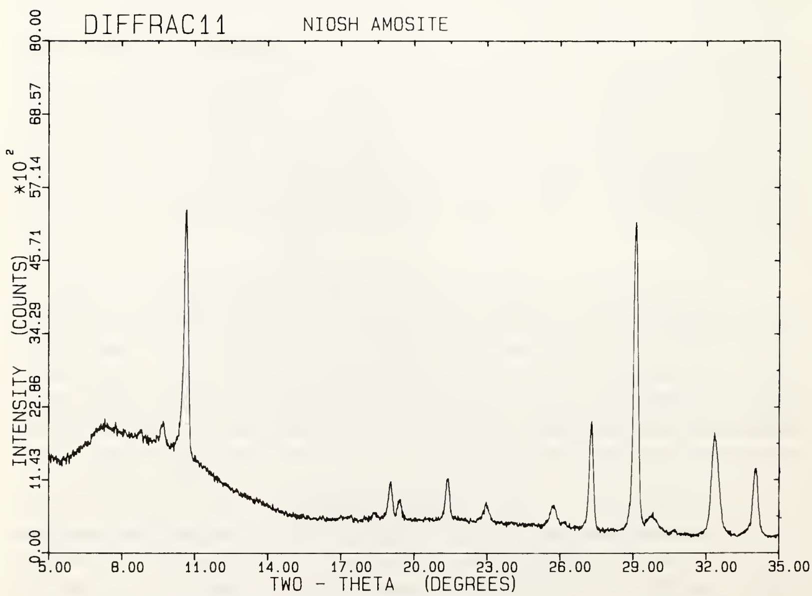

FIGURE 2. *Diffractogram of pure Amosite Asbestos*

TABLE I. *Counties Submitting Bulk Samples and Number of Positive Asbestos*

County	Number Buildings Sampled	Total Number Samples Submitted	Total Positive Microscopically	Total Positive by X-Ray
Adams	5	7	3	3
Allen	15	19	6	7
Bartholomew	17	46	17	9
Benton	7	17	7	9
Blackford	4	5	5	3
Boone	4	8	1	3
Brown	2	4	2	1
Carrol	1	5	1	1
Cass	10	14	8	9
Clark	23	26	9	5
Crawford	3	3	3	3
Daviess	1	1	1	1
Dearborn	9	19	9	10
Decatur	11	26	5	7
DeKalb	5	7	3	2
Delaware	41	174	55	59
Dubois	15	18	8	9
Elkhart	11	21	7	10
Fayette	2	4	2	2
Floyd	26	46	33	22
Fountain-Warren	4	8	5	4
Franklin	2	3	1	1
Grant	8	9	0	0
Greene	6	9	2	1
Hamilton	4	11	6	4
Hancock	2	3	0	1
Harrison	11	27	12	18
Hendricks	28	91	26	31
Henry	15	20	1	2
Howard	36	108	38	21
Huntington	18	35	9	12
Jackson	8	13	2	2
Jasper	4	9	2	2
Jay	10	20	1	1
Jefferson	7	33	11	9
Jennings	10	29	10	11
Johnson	8	8	6	6
Knox	3	3	2	2
Kosciusko	3	7	2	2
LaGrange	17	25	6	8
Lake	13	23	4	5
LaPorte	51	176	79	40
Madison	11	25	12	16
Marion	114	185	137	107
Marshall	2	4	1	1
Monroe	24	49	14	7
Montgomery	9	9	7	8
Morgan	4	10	3	3
Noble	6	6	6	6
Ohio	1	2	2	1
Orange	1	1	0	0
Owen	5	10	2	3
Perry	3	3	1	1
Pike	1	3	3	3
Porter	34	84	29	38
Pulaski	8	23	15	9
Randolph	6	42	11	11
Ripley	4	7	3	3

TABLE I.—Continued

County	Number Buildings Sampled	Total Number Samples Submitted	Total Positive Microscopically	Total Positive by X-Ray
Rush	2	5	3	5
St. Joseph	88	189	119	91
Shelby	23	59	19	13
Spencer	1	1	0	0
Starke	15	25	5	5
Steuben	9	24	7	8
Switzerland	5	10	1	2
Tippecanoe	8	11	2	3
Vanderburgh	16	23	1	1
Vigo	42	50	3	4
Warrick	18	56	9	14
Washington	12	33	9	6
Wayne	23	63	20	24
Wells	2	6	3	3
Whitley	15	81	10	21
Ball State Univ.	5	12	5	5
Taylor Univ.	1	2	1	2
Purdue	15	89	42	38

interest in performing a complete survey in that county. Other states (3,8) have reported that self-reporting surveys which rely upon the initiative of school officials to perform the asbestos surveys and samplying result in under reporting and incomplete responses to the program. Since Indiana did not have the resources available for a State administered and implemented program, the cooperation of the county health officers was encouraged using a uniform sampling and a hazard evaluation procedure such as the EPA guidelines (1) or the Ferris Index (9).

Microscopic analysis of the submitted samples showed 67.4 percent to contain identifiable asbestos fibers. The lower percent identified as positive by x-ray diffraction is due in part to sample preparation technique, sample matrix, impurity presence and percent of asbestos necessary to elicit enough counts to absolutely identify the crystal lattice patterns from the diffractogram.

County sanitarians were instructed to collect samples from areas using criteria such as traffic pattern, accessibility, water damage, friability, and condition. Air sampling was performed only at the request of the county sanitarian or school officials. Air samples were taken at seven schools in five different counties. Fiber counts ranged from 0.005 to 2.82 fibers per cubic centimeter of air. Using the OSHA regulation for asbestos fibers of 2.0 fibers per cubic centimeter of air, remedial action was suggested at concentrations over the OSHA limit.

Summary

Over 2,000 bulk samples have been analyzed by PLM and XRD for asbestos content. These results have been reported to county health offices and school officials. Air sampling has been performed in select areas where either school officials or county sanitarians have requested the services due to damage or planned renovation. Samples are still being received and analyzed and plans are being formulated to survey other public buildings in Indiana as resources allow.

Literature Cited

1. Asbestos-Containing Materials in School Buildings: A Guidance Document, Part 1. 1979. U.S. EPA.

2. Interim Method for the Determination of Asbestiform Minerals in Bulk Insulation Samples. 1980. U.S. EPA.

3. IRVING, et al. 1980. Asbestos Exposures in Massachusetts Public Schools. American Industrial Hygiene Association Journal. 41:270-276.

4. KLUG, H.P., and L.E. ALEXANDER. 1974. X-ray Diffraction Procedures., 2nd Ed., John Wiley and Sons. New York.

5. LEE, DOUGLAS H.K., and I. SELIKOFF. 1979. Historical Background to the Asbestos Problem. Environmental Research. 18:300-314.

6. MCCRONE, WALTER. 1980. The Asbestos Particle Atlas. Ann Arbor Science Publishers, Inc. Michigan.

7. MCCRONE, W., L. MCCRONE, and J. DELLY. 1980. Polarized Light Microscopy., 8th Ed., Ann Arbor Science Publishers, Inc. Michigan.

8. NOVICK, L.F., et al. 1981. Asbestos in Vermont Schools: Findings of a Statewide One-Site Investigation. American Journal of Public Health. 71:744-746.

9. Workshop on Asbestos: Definitions and Measurement Methods. 1978. W. Clark Cooper, 121-131 NBS. Special Publication 506.