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Impurities in Commercial Talcum Powders

of the shale unit produced a relationship to the enclosing formations.

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ASBESTOSFORM IMPURITIES IN COMMERCIAL TALCUM POWDERS

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ABSTRACT

Eighteen commercial talcum powders were examined by X-ray diffraction and the petrographic microscope to determine the amount and type of asbestosform mineral impurities which were fibrous serpentine, tremolite, actinolite, and anthophyllite and which varied in amount from 4 percent to 46 percent.

PURPOSE AND SCOPE

As part of a major study undertaken to determine the possible relationship of asbestosform mineral impurities in talcum powders to incidences of cancer in gerbils (L. I. Oster, 1971, personal communication), various commercial talcum powders were examined for the type and amount of impurities contained. An initial study by Merliss (1971) implied that talc-coated rice gave rise to stomach cancer, citing the asbestosform impurities in talc as the carcinogen. According to Se. Hoff, Churg, and Hammond (1964), asbestos is a proven carcinogen responsible for both pulmonary and gastro-intestinal cancer. Eighteen samples of commercial

talcum powders, used as baby powders, shave talcum powders, and spray talcum powders, in a wide price range were examined. Labels on the commercial containers did not indicate either the presence or the percentage of impurities of the commercial powders.

METHODS OF STUDY

The qualitative mineralogy of the samples was determined by X-ray analysis utilizing a Phillips Model 12045, 60 cycle X-ray diffractometer. Quantitative determinations of the various minerals and their textural characteristics were made with a Leitz Dialux-Pol petrographic microscope. Percentages listed in Table II were computed by using a mechanical stage and a millimeter point count totaling fifty millimeters.

RESULTS

The results of the X-ray and microscopic analyses are presented in Tables I and II.

Table I lists the various minerals which

TABLE I. Qualitative Mineral Analyses by X-ray Diffraction

Sample Number	Talc	Asbestosform Minerals			Carbonates	Anhydrite	Clay (Mica)	Misc. Mins.*
		(Serp.)	Trem-Act.	Anth.				
1	X	X	X			X	X	X
2	X	X				X	X	X
3	X	X				X	X	X
4	X	X	X	X	X	X	X	X
5	X	X	X			X	X	X
6	X	X		X	X	X	X	X
7	X	X			X	X	X	X
8	X	X	X	X	X	X	X	X
9	X	X				X	X	X
10	X	X				X	X	X
11	X		X		X	X	X	X
12	X				X	X	X	X
13	X		X	X	X	X	X	X
14	X	X			X	X	X	X
15	X	X	X			X	X	X
16	X		X			X	X	X
17	X		X	X		X	X	X
18	X	X		X		X	X	X

*Additives and inert minerals and compounds.

Figure 1

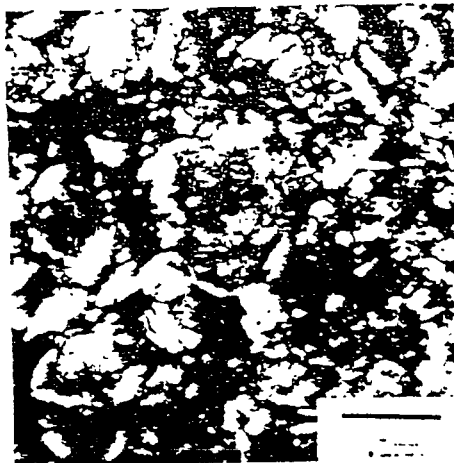


Figure 3

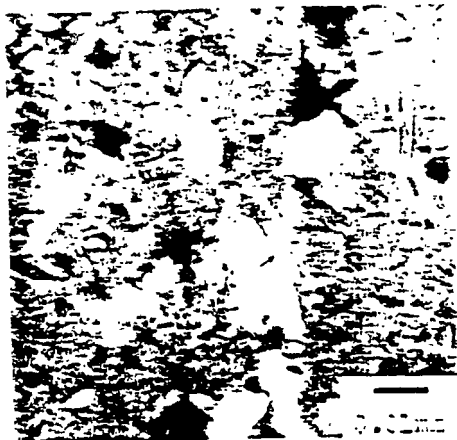


Figure 5

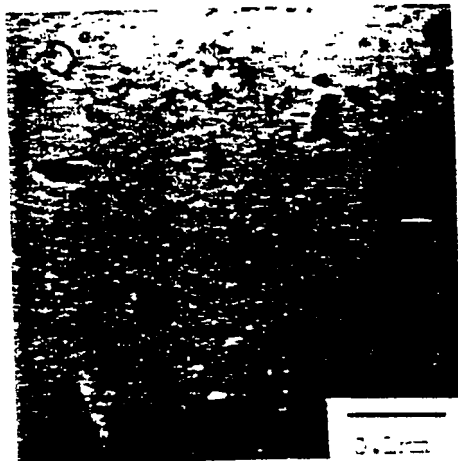


Figure 2



Figure 4

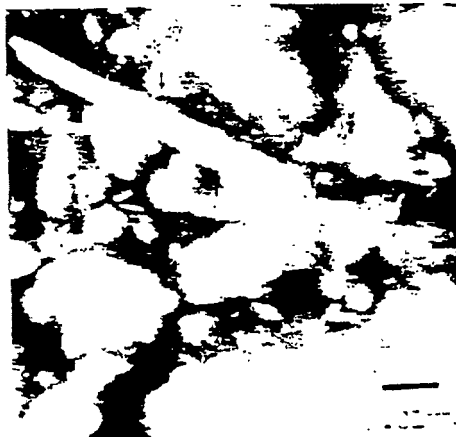


Figure 1.—Photomicrograph of sample 1 showing the distribution of talc flakes varying in width from 0.05mm to 0.20mm. The edges of the individual flakes that are birefringent (white) should not be confused with asbestosform minerals. Crossed Nicols.

Figure 2.—Photomicrograph of talc flake found in sample 2 showing birefringent edges. Slightly Crossed Nicols.

Figure 3.—Photomicrograph of sample 3 showing distribution of asbestos-form minerals in a talc-muscovite matrix. Slightly Crossed Nicols.

Figure 4.—Photomicrograph of sample 8 showing asbestosform tremolite. Crossed Nicols.

Figure 5.—Photomicrograph of sample 4 showing distribution of carbonate minerals. Uncrossed Nicols.

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occur in the eighteen samples of commercial talcum powders. In talc (Figures 1 and 2), all contain asbestosform minerals which are defined as fibrous tremolite-actinolite, and/or (Figures 3 and 4). Carbonaceous minerals were also detected in samples (Figure 5).

Table II summarizes the distribution of minerals found in the samples. The percentage of minerals varies from 48 percent in sample 1 to 92 percent in samples 2 and 3. Asbestosform impurities range from 10 percent in samples 10 and 12 to 46 percent in sample 13. Carbonate, micaceous minerals range from 1 percent (less than 1 percent) in samples 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18 to 20 percent in samples 1 and 2.

Discussion

Substantial amounts of mineral impurities occur in the eighteen commercial talcum powders investigated, although the level of impurities is low. Tremolite-actinolite is the normal impurity found in talc from metamorphosed magnesian rocks while serpentine minerals and phyllite are common accessories.

TABLE II. Quantitative

Sample Number	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	

*Less than 1 percent.

**Includes muscovite.

Figure 2



Figure 4



Micrograph of sample 1 showing the distribution of talc flakes varying in width from 5mm to 0.20mm. The edges of the individual flakes that are refringent (white) should not be confused with asbestosform minerals. Crossed Nicols.

Micrograph of talc flake and in sample 2 showing birefringent edges. Slightly Crossed Nicols.

Micrograph of sample 3 showing distribution of asbestosform minerals in a talc-muscovite matrix. Slightly Crossed Nicols.

Micrograph of sample 8 showing asbestosform tremolite. Crossed Nicols.

Micrograph of sample 4 showing distribution of carbonaceous minerals. Uncrossed Nicols.

occur in the eighteen samples of commercial talcum powders. In addition to talc (Figures 1 and 2), all samples contain asbestosform mineral impurities which are defined as fibrous serpentine, tremolite-actinolite, and/or anthophyllite (Figures 3 and 4). Carbonate and micaceous minerals were also detected in most samples (Figure 5).

Table II summarizes the percentages of minerals found in the powders. Talc varies from 48 percent in sample 13 to 92 percent in samples 2 and 10. Asbestosform impurities range from 4 percent in samples 10 and 12 to 46 percent in sample 13. Carbonate, micaceous and miscellaneous minerals range from a trace (1 percent) in samples 2, 3, 11, 16, and 18 to 20 percent in samples 4 and 12.

DISCUSSION

Substantial amounts of asbestosform mineral impurities occur in each of the eighteen commercial talcum powders investigated, although the labels listed no impurities. Tremolite-actinolite is the normal impurity found in talc derived from metamorphosed magnesium carbonate rocks while serpentine and anthophyllite are common accessory minerals

in talc produced from altered ultrabasic rocks (Cooper and Hartwell, 1970). However, the labels of the commercial samples did not designate the source of the raw talc. A wide retail price range was represented by the eighteen samples investigated, but the percentage of asbestosform impurities was not found to be related to price.

ACKNOWLEDGMENTS

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TABLE II. Quantitative Mineral Analyses by Petrographic Microscope (Volume Percent)

Sample Number	Percent Talc Flakes	Percent Carbonate Grains	Percent Asbestosform Minerals
1	73	5	22
2	92	trace	8
3	**79	trace	21
4	57	20	23
5	82	trace to 1	18
6	72	13	15
7	89	5	6
8	61	5	34
9	80	4	16
10	92	4	4
11	86	trace	14
12	76	20	4
13	48	6	46
14	90	4	6
15	74	4	22
16	80	trace	20
17	70	6	24
18	76	trace	24

*Less than 1 percent.
**includes muscovite.