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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 + percent to 46 percent.

PURPOSE AND SCOPE

As part of a major study undertaken to examine the possible relationship of asbestosform mineral impurities in talcum powders to incidences of cancer in gerbils (I. 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 Selikoff, 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 (Serp.	Trem-Act.	Anth.)	Carbonates	Anhydrite	Clay (Mica)	Misc. Mins.*
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
8	X	X	X	X	X	X	X	X
9	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
14	X				X	X	X	X
15	X	X	X			X	X	X
16	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

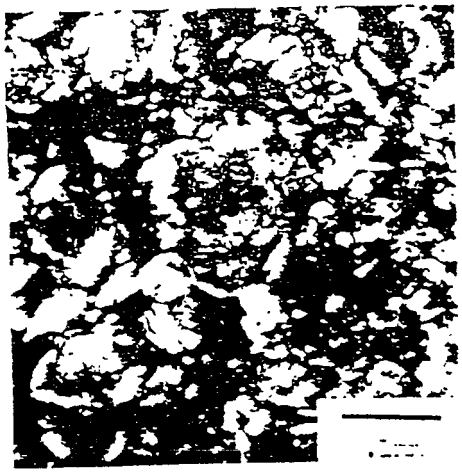

Figure 2

Figure 3

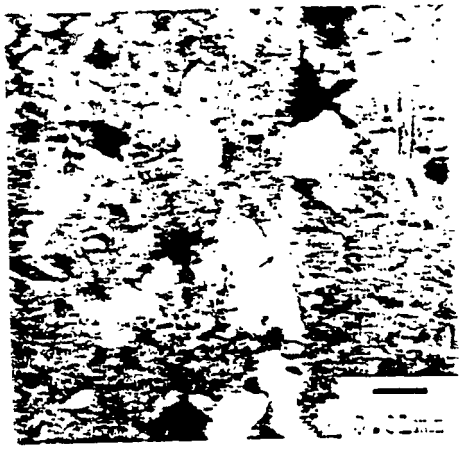

Figure 4

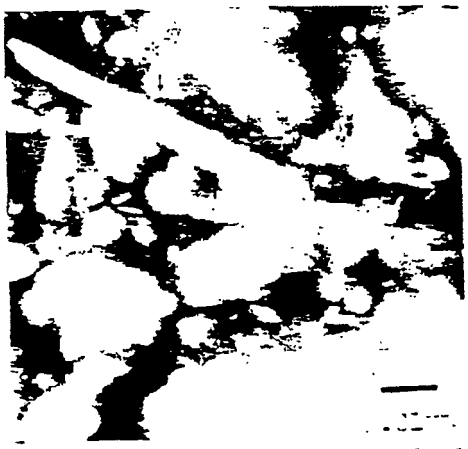

Figure 5

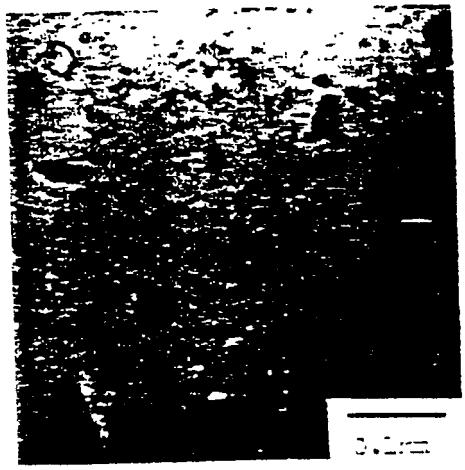

Figure 1.—Photomicrograph of sample 1 showing the distribution of talc flakes varying in width from 0.05mm to 0.20mm. The edges of the individual flakes that are birefringent (white) should not be confused with asbestosform minerals. Crossed Nicols.

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 asbestosform minerals in a talc-muscovite matrix. Slightly Crossed Nicols.

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

Figure 5.—Photomicrograph of sam[illegible] showing distribution of c[illegible]ate minerals. Uncrossed Nicols.

occur in the eighteen sam
mercial talcum powders. I
talc (Figures 1 and 2), all
tain asbestosform minera
which are defined as fibro
tremolite-actinolite, and/or
(Figures 3 and 4). Carbona
eous minerals were also de
samples (Figure 5).

Table II summarizes th
of minerals found in the
varies from 48 percent in
92 percent in samples 2 and
form impurities range from
samples 10 and 12 to 46 pe
ple 13. Carbonate, micaceo
laneous minerals range fro
percent) in samples 2, 3, 1
to 20 percent in samples

Discussion

Substantial amounts of
mineral impurities occur
eighteen commercial talcu
vestigated, although the l
impurities. Tremolite-acti
normal impurity found i
from metamorphosed magn
ate rocks while serpentin
phyllite are common acce

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.

gure 2

Figure 4

tomicrograph of sample 1 wing the distribution of talc es varying in width from 5mm to 0.20mm. The edges the individual flakes that are efringent (white) should not confused with asbestosform nerals. Crossed Nicols.

otomicrograph of talc flake nd in sample 2 showing bire- gent edges. Slightly Crossed ols.

otomicrograph of sample 3 owing distribution of asbestos- m minerals in a talc-musco- e matrix. Slightly Crossed ols.

otomicrograph of sample 8 owing asbestosform tremolite. ossed Nicols.

otomicrograph of sample 4 owing distribution of carbon- 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.