Received: 8 August 2018 | Revised: 14 February 2019 | Accepted: 17 February 2019

DOI: 10.1002/ajim.22969

BRIEF REPORT

WILEY AMERICAN JOURNAL OF INDUSTRIAL MEDICINE

Asbestos in commercial indian talc

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Abstract

Background: Easily available commercial Indian talc products widely used in Southeast Asia were examined for the presence of asbestos. Asbestos in talc products carry all risks of asbestos-related disease.

Methods: Using polarizing light microscopy, transmission electron microscopy (TEM), electron diffraction, and X-ray analysis, multiple over-the-counter Indian talc products were examined for the presence of asbestos.

Results: Results In an initial group of five Indian talc products, one was found to contain tremolite asbestos. The second group of eight products was tested and six of eight contained tremolite asbestos as well. No other regulated amphibole was found.

Conclusion: Large quantities of body talc products containing asbestos are used throughout Southeast Asia and are likely to pose a public health risk for asbestos-related diseases, especially for the cancers related to asbestos exposure. The country of origin in which the talc examined was sourced for production is unknown to the authors, and further investigation to measure associated public health risk is needed.

KEYWORDS

asbestos, cancer implications, consumer products, Indian talc, tremolite

1 | INTRODUCTION

As the international effort to eliminate asbestos-related diseases continues,[1] public health concerns surrounding the presence of asbestos in consumer talc products persists.[2-5] This is not a recent development.[6] Rohl, Langer, and Selikoff[7,8] raised the awareness of asbestos in talc and personal talc products over 25 years ago. Talc is composed of the elements magnesium, silicon, and oxygen, and is classified as a hydrous silicate mineral.[9] The asbestos-forming minerals serpentine and amphibole form under similar geologic conditions as talc, and are also hydrous silicate minerals containing magnesium, silicon, and oxygen. It is this close mineralogic relationship that is responsible for the common comineralization of talc and asbestos, not to be confused with a contaminant that was added after the mine.[10] Talc has been commercially used in personal hygiene and cosmetic products to aid in keeping skin dry and prevent rashes, as this mineral can be finely ground, provide absorbent anticaking properties, and promotes a soft, cool feel.[4,5,9]

Since the late 19th century, the intimate relationship between talc and asbestos formations has been observed by the geological and industrial communities.[7,8,10-13] The International Agency for Research on Cancer (IARC) recognizes this relationship and holds the position that any talc supply or products that contain asbestos should be treated as asbestos, accordingly a Group I carcinogen. In fact, the IARC Working Group decided to expand the name of the Group I carcinogen from "talc containing asbestiform fibers" to "talc containing asbestos or other asbestiform fibers," which "should be understood to mean any mineral, including talc," when it grows in the asbestiform habit.[5] It is, therefore, relevant to consider what the medical implications and public health consequences are for

populations which are exposed to these substances in domestic settings in addition to traditional workplace settings.

The medical implications of using talc products containing asbestos include the malignant and nonmalignant diseases associated with any asbestos exposure as well as those related to talc.[5] IARC has established a causal association between all forms of asbestos exposure and cancer of the larynx, lung, ovaries, peritoneal mesothelioma, and pleural mesothelioma.[5] Nonmalignant diseases associated with asbestos include asbestosis, asbestos warts, and pleural effusion, pleural plaques, and diffuse pleural fibrosis[5,14] Other reports of disease among those exposed to asbestos include renal, oropharyngeal, and gastrointestinal cancers.[14,15] Talc without asbestos can itself produce talcosis.[16,17]

A review of the literature that examines asbestiform materials not regulated as asbestos finds that either deposits with only true asbestos are being reported on with no admixed minerals. When there is evidence of asbestiform materials as part of the talc deposit there is usually also evidence of regulated asbestos fibers; therefore, it is difficult to state what role just nonasbestos asbestiform materials on their own may be playing in the health of those populations studied.[18]

The World Health Organization (WHO) reports that 125 million people are occupationally exposed to asbestos worldwide and that approximately half of all occupational cancer deaths are believed to be caused by asbestos.[1] The WHO further states that global asbestos exposure in the home is associated with several thousand deaths annually.[1] There are no population estimates of those exposed to asbestos contaminants in personal care products; therefore, substantial data to measure the past and future asbestos-induced burden of disease are not available. This lack of adequate data is significant when considering the traditional underreporting of diseases, such as mesothelioma.[19]

While Western countries, such as the United States, have the capability to engage in the surveillance of diseases, such as mesothelioma,[20] many developing nations throughout Southeast Asia exercise minimal to no mesothelioma surveillance.[21] In addition to the minimal surveillance of asbestos-related diseases in Southeast Asia, the majority of these countries continue to permit the commercial use of asbestos despite its health effects,[22,23] which is counter to the trends in global asbestos production and consumption.[23] The combination of these circumstances amplifies the challenge for public health.

Many of these nations, such as India and other Southeast Asian countries, face the risk of dermal heat disorders due to the hot and tropical climate.[24,25] One such disorder is miliaria, a widely recognized, heat-induced dermatitis that presents as a rash and has been documented since the time of Hippocrates.[26] In modern vernacular, the condition is commonly referred to as "prickly heat".[26] The risk of miliaria is significant for anyone exposed to a hot and humid climate. Those of lower socioeconomic status, who usually have more exposure to these conditions, are at elevated risk.[25] In India alone, the population exceeds 1.33 billion, representing a significant portion of the global population exposed to the risk of heat stress.[27]

To combat the risk of sweat-induced dermatitis, major manufacturers market talcum powders (cosmetic-grade talc) to the Indian and greater Southeast Asian populations.[16] These powders are advertised to cool against the effects of "prickly heat" and some claim to have bacteriostatic effects. These powders come in a variety of scents that would appeal to a wide range of consumers.

In light of the recent evidence of the asbestos contamination (or, more accurately asbestos comineralization) and subsequent personal injury litigation related to personal hygiene and cosmetic talc products sold in the West, the objective of this study was to determine if similar product contamination is observed in cosmetic talc sold in the East, as it is known that commercial talc deposits exist in India[2,3,10,28-30]

2 | METHODS

2.1 | Analytical procedures

Polarized Light Microscopy (PLM) and Transmission Electron Microscopy (TEM) analyses were conducted following the analytical procedures described in the U.S. Environmental Protection Agency "Test Method EPA/600/R-93/116: Method for the Determination of Asbestos in Bulk Building Materials". PLM analyses were conducted on a Leica DM750P petrographic microscope with cross-polarized filters, wave retardation, and dispersion staining techniques at magnifications up to 400×. TEM analyses were conducted on a JEOL 2000FX TEM equipped with energy-dispersive X-ray analysis (EDXA) and selected-area electron diffraction (SAED) at magnifications up to 50,000×, at an accelerating voltage of 100KeV. Since it has been repeatedly found that countable asbestos structures can occur in talc below the resolution of PLM7,[31] TEM analysis was conducted on all samples when definitive results were not obtained through PLM alone. Further, it has been shown that as little as 0.001% of asbestos in loose clay soil can produce around 0.1 fiber/cc of asbestos in the air with a respirable dust concentration of around 5 mg/m^3.[32]

Data from Libby, Montana, and other sites in the US provide evidence that soil/debris containing significantly less than 1% asbestos can release unacceptable air concentrations of all types of asbestos fibers (ie, serpentine chrysotile and amphibole tremolite).[33] The TEM analytical area of final preparations was therefore expanded to increase analytical sensitivity, i.e., the area of the final filter analyzed was increased to facilitate detection of lower asbestos fiber concentrations.

Quantification of countable asbestos structures per gram weight talc (str/g) was facilitated in TEM final analyses based on the asbestos counting criteria for structures containing fibers greater than 0.5 micrometers in length with at least a 5:1 aspect ratio, as described in the Asbestos Hazard Emergency Response Act (AHERA) and ASTM methods D6281, D5755, D5756, and D6480, as well as in ISO 10312 and 13794. These counting criteria are consistent with the procedure for the analysis of talc for asbestos as published by Millette.[34] Also consistent with Millette, analytical sensitivity varied based on total filter particle loading and area analyzed.[34-36]

2.2 | Preparations

The samples were prepared for PLM analysis by initial examination under a stereomicroscope at magnifications between 4 to 20×. Grain mounts were representative of the homogeneous powder constructed using appropriate refractive index liquid(s) for the determination of optical characteristics consistent with the asbestos-forming minerals. For electron microscopy analysis, a portion of the sample was weighed and suspended in an alcohol/ deionized water mix. Measured aliquots of the sample suspension were then filtered through a 0.2 µm mixed cellulose ester filter (MCE). The final MCE filter was dried, collapsed with acetone, and coated with carbon in a vacuum evaporator. The fibers and solids collected on the carbon-coated filter replicate were transferred onto copper grids for TEM analysis.

2.3 | Detection limits

All TEM scans in this analysis were at a minimum of 200 grid openings for samples where no fibers are identified. If there are abundant fibers, that number can decline significantly when a smaller number of grid openings demonstrate sufficient concentration calculation. The analytical sensitivity is therefore variable based on the overall loading of the filter, the number of grid openings, analyzed aliquot of the suspension, size of the individual grid openings, and weight of the original talc suspended. Of course, the actual size of fiber can vary greatly, so concentrations calculated as asbestos structures per gram are not directly comparable to a weight percent or parts per million value.

Detection limits in this study, therefore, varied from sample to sample, depending on the optimum suspension dilution required to achieve appropriate loading, as well as relative ease or difficulty in finding the asbestos fibers on the final filtrations. Generally, the lowest detection limits calculated were for those samples where no fibers were detected, in the 1×10^6 structures per gram range, which would equate to <0.0001% by weight, assuming average fibers of 5 µm x 0.25 µm, and the specific gravity of those fibers based on the mineral tremolite (the most common asbestos type determined in this study).

Each sample was prepared by suspending 20 to 80 mg of the talc product in 400 mL of water/alcohol mix, followed by filtering 1 to 5 mL of that suspension onto a 47 mm filter, which was then prepared for direct examination under TEM on copper grids. The analysis is an initial scan of the preparations, a minimum of two grids each containing 100 grid openings of variable size (usually approximately 0.01 mm^2) are scanned at 1200×, and individual fibrous structures evaluated at 25,000× (chemistry by EDS, crystal structure by diffraction, and fiber morphology, eg, length and width).

2.4 | Initial sample set

In February 2015, five samples of commonly available, over-the-counter brands of cosmetic talcum powders were purchased in India; some products were manufactured by multi-national corporations that originated in the United States. The mining source and location of talc used in these products are unknown. These purchases were made on the open market available to all Indian customers. The products were marketed for personal application as "beat the heat" fragranced talcum powders to be applied to the skin of the consumer. All samples were shipped to a testing laboratory for the purpose of evaluation. The product samples were labeled as 1) *"IA Talc,"* 2) *"IB Talc,"* 3) *"IC Talc,"* 4)*"ID Talc,"* and 5)*"IE Talc."*

Testing of these talc products was conducted to assess the presence of asbestos, and whether the asbestos present in these samples was aerosolizeable and quantifiable. When testing is conducted for asbestos and talc in the lab setting, the presence of fibrous talc and possible transitional structures are noted when observed. The samples were tested to include examination by SAED) and EDXA; a.k.a., EDS or EDX).

2.5 | Repeat testing of initial sample set

To confirm the first test results, these original five samples underwent a repeat analysis using the same test methods. The presence of asbestos, specifically, asbestiform tremolite, was confirmed in one of the products ("*ID Talc*"). As the presence of asbestos in this commonly available talc product was found to be substantial and repeatable, it was decided that further testing of other available personal hygiene talcs from India was warranted. The testing lab made online purchases of four additional varieties of talc products sold by the same manufacturer as the above product, as well as four varieties of another talcum brand (*"IA Talc"*) through an Indian-based retail outlet.

2.6 | Second sample set

This second set of samples were labeled as (1)*"ID.1 Talc,"* (2)*"ID.2 Talc,"* (3)*"ID.3 Talc,"* (4) *"ID.4 Talc,"* (5)*"IA.1 Talc,"* (6)*"IA.2 Talc,"* (7)*"IA.3 Talc,"* and (8)*"IA.4 Talc."* The samples were tested in the same manner as the initial sample set for the presence of asbestos in those products using the same analytical methods.

3 | RESULTS

3.1 | Initial sample set product: analyses, light microscopy

In the initial sample set, analysis of preparations revealed abundant mineral particulate, including platy and fibrous talc in all products tested (see Table 1). PLM analysis was able to determine that the products contained fibers with optical properties consistent with talc and some possible asbestiform amphiboles. Overall, the talc product was found to be fibrous by light microscopy. Preparations of the sample were, therefore, made for the determination of potential asbestos content by TEM.

TABLE 1 Initial sample set analytical summary

Product (initial sample set)	First qualitative assessment of tremolite asbestos	Second qualitative assessment of tremolite asbestos
	Presence: *Yes or No*	Presence: *Yes or No*
IA Talc	*No*	*No*
IB Talc	*No*	*No*
IC Talc	*No*	*No*
ID Talc	*Yes*	*Yes*
IE Talc	*No*	*No*

TABLE 2 Second sample set analytical summary

Product (second sample set)	PLM findings of abundant mineral fibers including fibrous talc?	TEM quantitative identification of tremolite asbestos?
IA.1 Talc	*Yes*	*Yes*
IA.2 Talc	*Yes*	*Yes*
IA.3 Talc	*Yes*	*Yes*
IA.4 Talc	*Yes*	*Yes*
ID.1 Talc	*Yes*	*No*
ID.2 Talc	*Yes*	*No*
ID.3 Talc	*Yes*	*No*
ID.4 Talc	*Yes*	*Yes*

3.2 | Initial sample set: Asbestos analysis

Subsequent analysis of the initial set by TEM analysis confirmed the PLM findings of abundant mineral fibers including fibrous talc in all of the initial Indian talc products tested. Fibrous talc is noted when the mineral appears as fibrous or bundles both by light microscopy, such as PLM, and electron microscopy, such as TEM. The presence of asbestos, specifically asbestiform tremolite, was confirmed only in the *"ID Talc"* product (see Figure 1); the asbestiform structures were of a countable concentration above baseline background.[34] This is classified as substantial asbestos, that is, asbestos fibrous structures were found meeting the counting criteria of all airborne asbestos containing methods.[35,37-39]

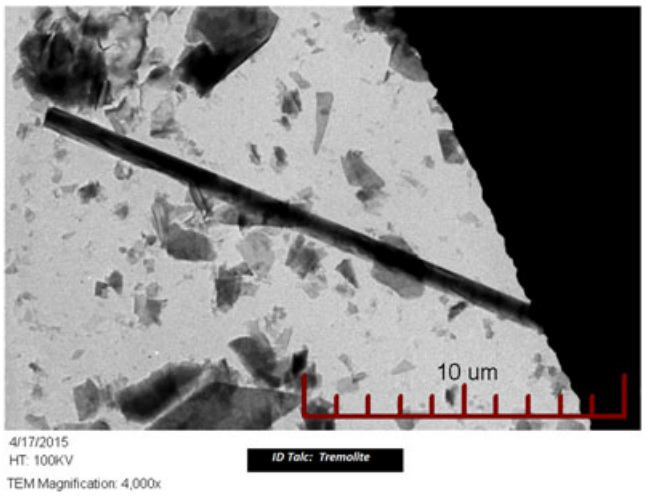

FIGURE 1 Tremolite asbestos fiber in "*ID Talc*," found in the first testing of this product. TEM magnification 4000×. Total fiber dimensions 61.5 μm long by 0.5 μm wide equates aspect ratio >120:1 This figure shows the part of the fiber extending into the grid opening. The majority of the fiber-structure length extends underneath the copper grid bar (to the right of the structure), extending into the adjacent grid opening. As can be seen from the micron marker, less than one-third of the entire length was captured in this image. This image demonstrates well the amphibole details alongside platy/sheets of talc. TEM, transmission electron microscopy [Color figure can be viewed at wileyonlinelibrary.com]

3.3 | Second sample set: PLM and TEM analyses for fibrous talc and asbestos

PLM findings of abundant mineral fibers including fibrous talc was evident in all of the second sample set of products. TEM analysis was able to qualitatively identify tremolite asbestos present in *"ID.4 Talc"* and the *"IA.1 Talc," "IA.2 Talc," "IA.3 Talc," and "IA.4 Talc"* products (see Table 2 and Figures 2-5). Asbestiform tremolite fiber str/g were also quantified for these same talc products. Concentrations of tremolite asbestos in the products were calculated for structures less than 5 μm and greater than 5 μm; the sum of the structure totals (less than 5 μm and greater than 5 μm) are reported as all structures (see Table 3). Among these,*"IA.3 Talc"* had the lowest total tremolite asbestos at a sum of 4.55 million str/g, with higher levels in*"IA.1 Talc"* (10.5 million structures per gram), *"IA.2 Talc"* (14.4 million str/g), *"IA.4 Talc"* (20.4 million str/g), and *"ID.4 Talc,"* which contained a sum of 59.9 million str/g of tremolite asbestos.

3.4 | Asbestiform talc structures detected in samples

Abundant fibrous structures of the mineral talc were identified in the cosmetic talcum powders tested. Two basic morphologies were common of the fibrous talc: more parallel fibers or "bundle of sticks" talc structures were observed, in addition to more lath-like "ribbons" of talc, often exhibiting kinks, beds, or folds. Although many of these structures would be countable as asbestos if they were the minerals regulated as such, the use of the term "asbestiform" when describing talc is controversial. As talc is a replacement mineral that does not crystallize from molten rock, it is often pseudomorphic after the protolith, that is, forms the shape of the mother rock from which it was derived.

Although it is common to observe the mineral anthophyllite in association with talc, that mineral was not observed in any of the samples in this study. Fibrous talc was observed in all of the samples analyzed for this study, occasionally in abundance, but talc fibers or fiber structures were not quantified, as there are no published methods or counting criteria for talc fibers or complex structures.

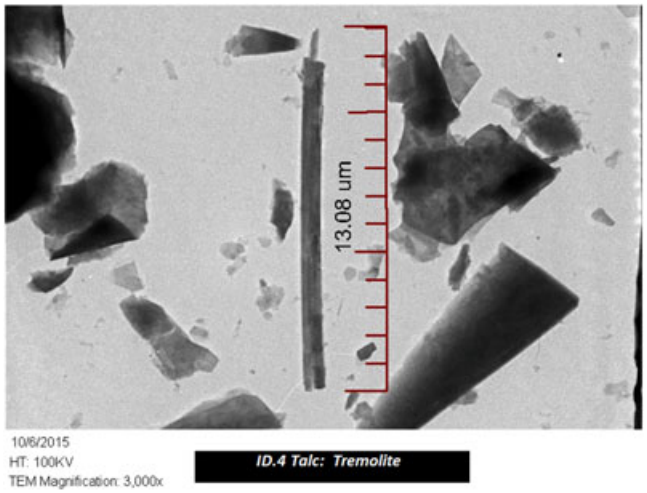

FIGURE 2 Tremolite asbestos fiber bundle in "*ID.4 Talc*," found in the second batch of testing this product.TEM magnification 3000×. Bundle dimensions are 13.1 μm long by 0.74 μm wide. Bundle thickness comprises numerous individual fibers within the structure; therefore, length to width aspect ratios should be based on constituents rather than whole bundle widths. As this structure comprises over a dozen individual fibers, it is inappropriate to calculate aspect ratio as 13.1/0.74 = 1:17.7, as known individual fibers greatly exceed that aspect. TEM, transmission electron microscopy [Color figure can be viewed at wileyonlinelibrary.com]

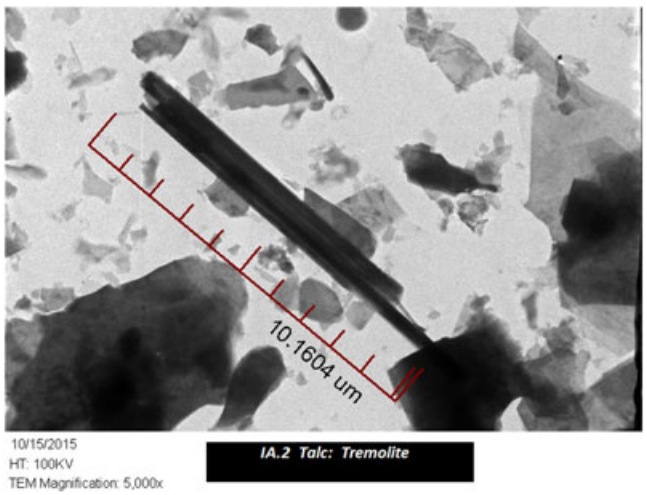

FIGURE 3 Tremolite asbestos fiber bundle in "*IA.2 Talc*," found in the first testing of this product. TEM magnification 5000×. Constituent fibers >10 μm in length, less than 0.1 μm in width demonstrate aspect ratios up to and exceeding 100:1. Note both platy and fibrous talc also observed.As a bundle is defined as three or more fibers (or 2, by the International Organization for Standardization (ISO)) parallel and not separated by more than the width of a fiber, a bundle contains constituent fibers by definition. The micron marker was placed on the image when at the scope. This provided the ability to resolve the other end through the crystal from which it protrudes (conservative analysis indicates aspect ratios exceeding 100:1) [Color figure can be viewed at wileyonlinelibrary.com]

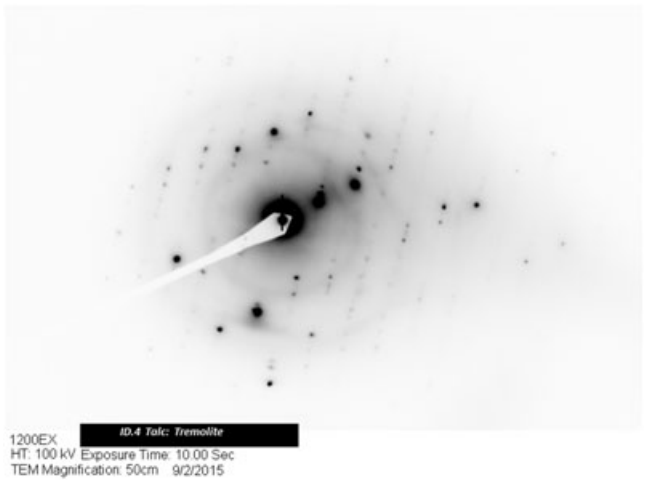

FIGURE 4 Selected-area electron diffraction (SAED) of tremolite structure found in the Indian talc product "*ID.4 Talc*." All asbestos structures used in the calculation of concentrations in this report were confirmed by morphology, chemistry (by energy-dispersive X-ray analysis: EDXA/EDS), and crystalline structure as demonstrated here by diffraction (SAED). Notice the 5.3 Å repeat of streaking lines consistent with the amphibole structure, and the arcing brighter bands demonstrating a nearby crystal zone axis

Analysis and quantifications were therefore limited to the six minerals regulated as asbestos, with established counting criteria.

4 | DISCUSSION

This product study of various talcum powders marketed to combat prickly heat, purchased from Indian retailers both over-the-counter and online, demonstrates the ease of general population access to such products and the potential for significant exposure to asbestos. The analytical results of this study confirm that asbestos exposure of the Indian and potentially greater Southeast Asian populations is not limited to traditional occupational settings. Products sampled in this study are sold in containers with 150 grams of product or more. For those products that tested positive for tremolite asbestos, the total product contamination for their containers ranges between a low of 600 million asbestos structures to high of 8 billion asbestos structures. These findings imply that the asbestos-related medical and public health implications to consider will need to extend to persons of both genders and all ages among this population group.

This study's confirmation of an underappreciated source of asbestos exposure, through personal care products, also highlights the risk that anyone within breathing range of these aerosolizeable, contaminated, talcum products incurs. With products of this nature being readily available and appealing to both genders, it is necessary to consider what the potential health risks and burdens of disease are for millions of exposed women of childbearing age and the children for whom they provide care. IARC has confirmed the causal association of asbestos with ovarian cancer and other cancers.[5] Shifts in perspective in epidemiologic surveillance are needed to

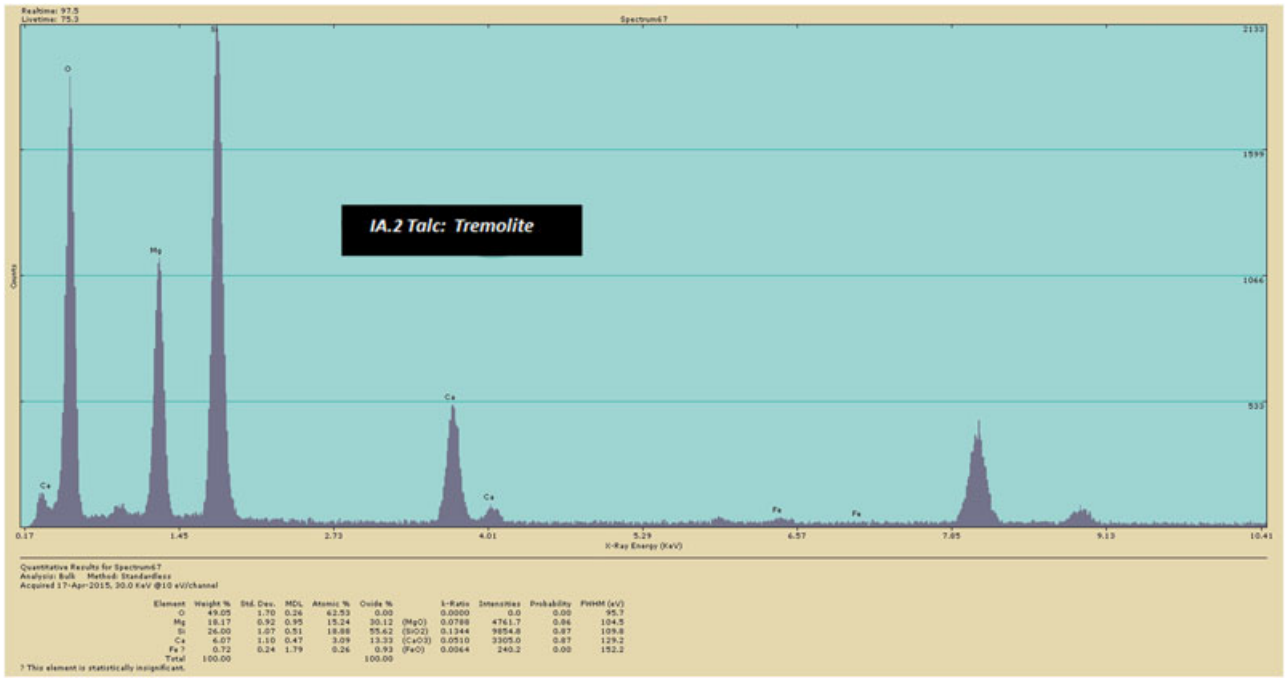

FIGURE 5 Energy-dispersive X-ray spectrum (EDX/EDS) showing chemistry of amphibole structure pictured in Figure 3 (tremolite bundle in "*IA.2 Talc*"). Relative ratios of magnesium (Mg), silica (Si), calcium (Ca), and iron (Fe) are consistent with the recognized chemical formula for the mineral tremolite: {Ca2}{Mg5.0-0.5Fe0.0-0.5}(Si8O22)(OH)2. Other peaks observed include oxygen (O) observable from the low-element detector used, and copper (Cu) resulting from the copper grid sample substrate [Color figure can be viewed at wileyonlinelibrary.com]

consider how to better collect, analyze, and disseminate data that apply to these consumer product exposures. It may also help us better understand a previously underappreciated source of exposure for those with asbestos-related cancers when no history of exposure can be elicited from those individuals.

A necessary measure to promote public health is to mandate quality control standards that guarantee all talc intentionally added as an ingredient to consumer products is tested before production and repeated testing is applied during production. Analyses conducted by the most rigorous and sensitive methods possible are required to assure the absence (ie, nondetectability) of asbestos in products. Further, records of where the talc was mined, and the specific records of testing must be maintained. End-users and manufacturers of those talc or talcum powder products should be held accountable for this information and make it available to consumers.

India's Consumer Protection Bill 2018 proposed legislation that would provide a measure of increased consumer protection; although, it remains under pending status in parliament.[40,41] If this or a similar bill eventually passes, India will be taking needed steps toward (a) establishing a central consumer protection authority, (b) subjecting manufacturers to imprisonment if they are found guilty of false or misleading advertising, (c) subjecting manufacturers to imprisonment if they are found guilty of the sale, storage, distribution, or importing of products that contain adulterants, and (d) introducing product liability action and class action concepts as avenues for consumer compensation.[40]

While the passage of this bill is a start toward protecting public health in general, until asbestos is also viewed as a hazard in India and banned, there will still be considerable risk to health.[5,21] The presence of amphibole asbestos (tremolite) among the products analyzed in this study confirms that asbestos exposure in India and potentially beyond is not limited to occupational origins. This heightened awareness of tremolite exposure in consumer products in India should also raise public health concern for the country that utilizes roughly 350,000 tons of chrysotile asbestos in approximately

TABLE 3 Tremolite asbestos structures count per gram (str/g) product

Product	Structures <5 μm	Structures ≥5 μm	All Structures
IA.1 Talc	6,280,000 str/g	4,190,000 str/g	10.5 million str/g
IA.2 Talc	7,210,000 str/g	7,210,000 str/g	14.4 million str/g
IA.3 Talc	3,030,000 str/g	1,520,000 str/g	4.55 million str/g
IA.4 Talc	15,300,000 str/g	5,090,000 str/g	20.4 million str/g
ID.4 Talc	20,000,000 str/g	39,900,000 str/g	59.9 million str/g

100 manufacturing plants—producing products such as cement piping, cement roofing, friction materials, textiles and insulation—with little regulatory oversight.[42] These 100 manufacturing plants employ nearly 300,000 employees.[42]

The products these asbestos using manufacturing plants produce are reaching millions within India alone.

The limitations of this study pertain to its design. The study was designed to demonstrate the potential for health risks and did not endeavor to identify health outcomes. It is not known to the authors where the manufacturers of these products marketed throughout India and Southeast Asia sourced their talc supply. The only fibers analyzed for this study were the six regulated fibers collectively called asbestos.

5 | CONCLUSION

Some global talc deposits are free of asbestos, while others are not.[5,7,8,10-13] Therefore, significant policy updates are necessary to promote product safety and accountability that protects the interest of consumers.[42] Without such measures, millions of people will be at heightened risk for asbestos exposure due to personal care talc products that contain millions of countable asbestos structures in every teaspoon full equivalent and diseases caused by such structures.

It is confirmed that these product samples are among those marketed and sold over-the-counter and online in India and other Southeast Asian countries. It is believed that this is the first report of such findings in India. It carries public health implications for Southeast Asia in general, and perhaps beyond. This study confirms that asbestos exposure in India and potentially elsewhere is possible through nonoccupational avenues previously overlooked.

AUTHOR CONTRIBUTIONS

TKJ conceived the idea for this work assisted with writing and participated in the final approval of the version to be published. EH assisted with writing, conducted bibliographic research, and participated in the final approval of the version to be published. SF assisted with writing, conducted analyses of materials, participated in the final approval of the version to be published, and was engaged in geologic, mineralogic, and laboratory work regarding asbestos, and has been retained by both plaintiffs and defendants in asbestos and talc-related matters. ALF participated in the design of the work, provided bibliographic references, assisted with writing, participated in the final approval of the version to be published, and has engaged in medical/legal work regarding asbestos, generally for plaintiffs.

ETHICS APPROVAL AND INFORMED CONSENT

No reviews and approvals needed, no human subjects.

DISCLOSURE (AUTHORS)

Dr. A.L. Frank regularly engages in medical/legal work regarding asbestos, generally for plaintiffs.

S. Fitzgerald, PG regularly engages in geologic, mineralogic, and laboratory work regarding asbestos, and has been retained by both plaintiffs and defendants in asbestos and talc-related matters.

DISCLOSURE BY AJIM EDITOR OF RECORD

None.

DISCLAIMER

None.

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How to cite this article: Fitzgerald S, Harty E, Joshi TK, Frank AL. Asbestos in commercial indian talc. *Am J Ind Med*. 2019; 62:385-392. https://doi.org/10.1002/ajim.22969