Short Fiber Tremolite Free Chrysotile Mesothelioma Cohort Revealed

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In 1995, Dell and Teta published a cohort mortality study of asbestos molding compound workers at a Union Carbide Corporation (UCC) plastics manufacturing plant in Bound Brook, New Jersey. They reported that the factory workers were exposed to "asbestos (mostly chrysotile)," implying that the asbestos used at the Bound Brook plant occasionally contained amphiboles. However, UCC statements and testimony from recent litigation indicate that the Bound Brook plant exclusively used short fiber chrysotile asbestos. These recent documents also point to lower exposures than those reported by Dell and Teta. This chrysotile-only cohort should be included in analyses of chrysotile potency. Am. J. Ind. Med.

BACKGROUND

In 1995, Dell and Teta published a cohort mortality study of workers at a Union Carbide Corporation (UCC) plastics manufacturing plant in Bound Brook, New Jersey in the *American Journal of Industrial Medicine* [Dell and Teta, 1995].[1] They reported ten pleural mesotheliomas and four cases of asbestosis. The study reported that the factory workers were exposed to "asbestos (mostly chrysotile)," implying that the asbestos used at the UCC plant occasionally contained amphiboles. Researchers have omitted this study from meta-analyses on chrysotile potency [Stayner et al., 1996; Berman and Crump, 2003; Li et al., 2004; Yarborough, 2006, 2007; Berman and Crump, 2008; Silverstein et al., 2009; Burdorf and Heederik, 2011; Lenters et al., 2011, 2012; Loomis et al., 2012; McCormack et al., 2012; Offermans et al., 2014]. Several of these meta-analyses have been used to support the position that chrysotile is the least potent fiber type with respect to the induction of mesothelioma [Stayner et al., 1996; Yarborough, 2006, 2007; Pierce et al., 2008; Hodgson and Darnton, 2010; Lenters et al., 2011, 2012; Loomis et al., 2012]. Other studies have found that chrysotile is a significant cause of mesothelioma [Yano et al., 2001; Kanarek, 2011].

UCC has recently released information on fiber use at the Bound Brook plant pursuant to litigation discovery requests in asbestos disease litigation. The purpose of this commentary is to review the historic UCC memoranda and letters along with current deposition testimony. We reviewed the documents for an explanation as to the possible confusion regarding the types of asbestos found at the Bound Brook plant as well as for new fiber exposure information.

FINDINGS

Fiber Type

Our review indicates that the Bound Brook plant exclusively used chrysotile asbestos. This conclusion is derived from an analysis of the following documents and deposition testimony. In a 1989 communication to the Environmental Protection Agency (EPA), UCC described the asbestos-related products manufactured at their Bound Brook mold manufacturing plant:

> Most Bakelite did not contain asbestos. At its peak, asbestos-containing Bakelite comprised 40% of the Bakelite produced by Union Carbide. The great bulk

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[1] This study was funded by Union Carbide Corporation and Teta was then an employee of UCC.

of non-asbestos Bakelite contained wood flour as a filler in lieu of asbestos. Asbestos-containing Bakelite fell into three classes of Bakelite which differed on the basis of the quantity and type of asbestos:

General Purpose Bakelite contained less than 12% asbestos. The asbestos consisted of short fiber, usually purchased from the Carey-Canada Corporation.

Heat Resistant Bakelite contained 25 to 30% asbestos (with one exception noted below). The asbestos consisted of short fiber asbestos, usually purchased from the Carey-Canada Corporation.

High Impact Heat Resistant (only manufactured until the mid-1960's) consisted of 50% asbestos [EPA, 1990].

As this memo explains, the asbestos used at the Bound Brook plant primarily came from the Carey Canada mine [EPA, 1990]. A study commissioned of the Carey mine by The Georgia Pacific Company, another asbestos product manufacturer, found it to be tremolite free [Gunter et al., 2007]. However, in this memo, UCC told the EPA that the High Impact Heat Resistant Bakelite™ contained crocidolite. Corporate representatives have since denied this in deposition testimony [Deposition of Susan Carrington, 2011]:

What I can tell you about this document [referring to the UCC EPA submission], based on review [of] Carlo Martino's testimony and independently other documents from the repository, is that the BMMZ itself is probably incorrect. It was probably BMZ at that time. And there were other formulations that correlated with this. Initially, Carlo had some testimony where he agreed with this document, because he had not been aware of it and had not been associated with the business in some time. But, **he later looked back at all his information and was very clear that – that this information is incorrect, and that there is no long fiber African blue or, as you describe it, crocidolite in this particular formulation** [Deposition of Susan Carrington, 2011, p.74]. (Emphasis added).

Q. Okay. BMZ 5250 is the crocidolite phenolic compound referenced in Exhibit – I believe it was 12, the EPA letter, correct?

A. No, that's not the case. It's not – it does not use crocidolite asbestos in the formulation, and to the best of my knowledge, from all the document reviews, talking with Carlo, **there has not been crocidolite asbestos ever used in the phenolic-molding compounds that were produced at Bound Brook** [Deposition of Susan Carrington, 2011, p.115] (Emphasis added.).

As this final line attests to, the communication to the EPA that suggested Bakelite™ contained crocidolite was likely incorrect.

Additionally, UCC's lawyers hired Exponent, a litigation consulting company, to recreate a Bakelite™ formula in order to test (and later testify regarding) historic exposures to the Bakelite™ molding compounds [Mowat et al., 2005]. The Exponent report notes that the raw material amounts were measured by weight and "based upon the historical Union Carbide batch sheet" which used "a type 7RF chysotile, the same type specified in the Union Carbide documents" [Cope, 1969; Scott, 2003]. 7RF was considered a "short" fiber that was under 1.70 mm in length [Bernstein et al., 2008].[2]

UCC also retained toxicologist Dennis Paustenbach, who was part of the team hired to recreate the Bakelite™ formulation. After examining the historic Bakelite™ formulation, Paustenbach testified that the workers were not exposed to crocidolite asbestos [Deposition of Dennis Paustenbach, 2014]:

Q. Have you ever asked the attorneys for Union Carbide: Give me the data on where these workers worked within the plant so I could be prepared to address how your ten workers were exposed to asbestos?

A. I was satisfied, when I studied this, that they were not exposed to anything other than chrysotile asbestos, either raw or otherwise [Deposition of Dennis Paustenbach, 2014, p. 121].

Fiber Concentrations

The documents reviewed additionally revealed that there were more exposure measurements taken at the Bound Brook plant than those which Dell and Teta had reported. Dell and Teta reported a sole measurement taken from an industrial hygiene report from 1968 [LaFrance, 1968] of dust levels between 8.7 and 20.1 million particles per cubic foot (mppcf).[3] Other than the 1968 monitoring, UCC reported results in f/cc. The exposures ranged from 0.3 to 14.1 f/cc;

[2] According to Bernstein et al., "the determination of fiber grade is based upon the Canadian chrysotile asbestos classification [. . .] milled asbestos grades are classified into groups 3–7 using a Quebec Standard Testing Machine, which actively sieves the fiber through different mesh screens using a rotating sieve shaker. The mesh size of the smallest screen used "corresponds to a nominal sieve opening of 1.70 mm."

[3] 5 f/cc is approximately 30 mppcf; thus these measurements are approximately between 1.45 and 3.35 f/cc.

however, all measurements were under 5 f/cc except for 14.1 f/cc when an operator was dumping five bags of phenolic molding compound 5,303 containing 30% Canadian 7RF9. The worker was wearing a respirator at this time and all other samples (of 10 total) taken in different departments were between 0.8 and 5 f/cc [Bradley, 1972; Kleber, 1973].

The samples referenced by Dell and Teta were taken at the charging station where asbestos bags were dumped into a hopper [LaFrance, 1968]. UCC reported the results as a percentage of the "allowable dose," which was 5 f/cc in 1974. Other similar samples taken by UCC over the next 5 years indicate that the samples were short-term (<15 min), and not time-weighted averages (TWAs) [Cope, 1972; Kleber, 1973]. None of the results exceed 5 f/cc TWA.

In 1974, UCC tested mixer operators dumping raw asbestos from bags, the charge roll operators shoveling raw mix onto the rolls, and the CBS bag packer [Neal, 1974]. Eight-hour TWA exposures during bag dumping were between 1.3 and 1.6 f/cc [Neal, 1974]. The exposures of the charge role operators were "satisfactory" ranging from 0.7 to 1.1 f/cc ". . .despite rather frequent shoveling of raw mix onto the rolls during monitoring" [Neal, 1974]. Finally, the CBS bag packer exposure level was "negligible" at 0.3 fibers per milliliter [Neal, 1974]. UCC required workers in this area to wear respirators, although not all complied [Neal, 1974].

Many of the Bakelite products also used non-asbestos fibers. UCC sampled during production runs of these non-asbestos manufacturing processes and found fiber levels between 0.6 and 3 f/cc [Cope, 1972]. Therefore, the UCC monitoring results probably overestimated actual asbestos exposures due to the presence of non-asbestos fiber during some product manufacturing.

CONCLUSION

The Bound Brook exposure data demonstrate a risk at lower levels of exposure to chrysotile than those which have been previously reported. This chrysotile-only cohort should be included in analyses of chrysotile potency. The incorporation of the new exposure information on this cohort might require downward revision of the "no-effect" level for chrysotile carcinogenicity.

DISCLOSURE BY AJIM EDITOR OF RECORD

Dr. Egilman testifies in asbestos toxic tort litigation at the request of injured workers and family members of exposed workers and at the request of asbestos product manufacturing companies. He served as an expert for UCC in the Bhopal litigation. Tess Bird works for Never Again Consulting.

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