

BORG-WARNER CORPORATION,
now known as **Burns International**
Services Corporation, Petitioner,

v.

Arturo FLORES, Respondent.

No. 05-0189.

Supreme Court of Texas.

Argued Sept. 29, 2006.

Decided June 8, 2007.

Rehearing Denied Oct. 12, 2007.

Background: Automobile mechanic brought asbestos-related products liability action against brake pad manufacturer. The 319th District Court, Nueces County, Ricardo Garcia, J., entered judgment on jury verdict for mechanic and awarded compensatory and punitive damages. Manufacturer appealed. The Corpus Christi-Edinburg Court of Appeals, 153 S.W.3d 209, affirmed. Review was granted.

Holding: The Supreme Court, Wallace B. Jefferson, C.J., held that plaintiff's evidence was legally insufficient to establish that defendant's asbestos-containing brake pads were substantial factor in causing plaintiff's alleged asbestosis.

Court of Appeals reversed; judgment rendered for defendant.

1. Products Liability ◊62

A person's exposure to "some" respirable fibers is not sufficient to show that a product containing asbestos was a substantial factor in causing asbestosis.

2. Evidence ◊571(9)

Products Liability ◊83

Plaintiff mechanic's evidence was legally insufficient to establish, in products liability action, that defendant manufactur-

er's asbestos-containing brake pads were substantial factor in causing plaintiff's alleged asbestosis; plaintiff merely presented expert evidence that mechanics in the braking industry could be exposed to "some" respirable asbestos fibers when grinding brake pads or blowing out the housings, and of the frequency, regularity, and proximity of plaintiff's exposure to asbestos, without presenting any dosage-related evidence of approximately how much asbestos plaintiff might have inhaled.

Deborah G. Hankinson, Elana S. Einhorn, Law Offices of Deborah Hankinson PC, Elizabeth L. Phifer, Smith Underwood & Perkins, P.C., Dallas, Rene Luis Obregon, Corpus Christi, for Petitioner.

Scott W. Wert, Foster & Sear LLP, Arlington, Brent M. Rosenthal, Misty Ann Farris, Kevin Duane McHargue, Baron & Budd, P.C., Dallas, for Respondent.

Joe R. Greenhill, Baker Botts LLP, Austin, David A. Oliver Jr., Porter & Hedges, L.L.P., Reagan W. Simpson, King & Spalding LLP, Sandra Thourot Krider, Edwards Burns & Krider LLP, David A. Chaumette, Shook, Hardy & Bacon, L.L.P., Houston, for Amicus Curiae.

Chief Justice JEFFERSON delivered the opinion of the Court.

Nearly ten years ago, we observed that asbestos litigation had reached maturity. *In re Ethyl Corp.*, 975 S.W.2d 606, 610 (Tex.1998). Even mature claims evolve, however, and courts have continued to struggle with the appropriate parameters for lawsuits alleging asbestos-related injuries.¹ While science has confirmed the

1. In 2005, Texas, like Louisiana and Ohio before it, adopted a medical criteria statute

governing claims for injuries resulting from asbestos or silica. Act of May 16, 2005, 79th

threat posed by asbestos, we have not had the occasion to decide whether a person's exposure to "some" respirable fibers is sufficient to show that a product containing asbestos was a substantial factor in causing asbestosis. Because we conclude that it is not, we reverse the court of appeals' judgment and render judgment for the petitioner.

I

Factual and Procedural Background

Sixty-six-year-old Arturo Flores is a retired brake mechanic. Flores spent much of his working life—from 1966 until his retirement in 2001—in the automotive department at Sears in Corpus Christi. While there, Flores handled several brands of brake pads, including those manufactured by Borg-Warner.² Flores used Borg-Warner pads from 1972–75, on five to seven of the roughly twenty brake jobs he performed each week.³ Borg-Warner disk brake pads contained chrysotile⁴ asbestos fibers, fibers that comprised seven to twenty-eight percent of the pad's weight, depending on the particular type of pad. Flores's job involved grinding the pads so that they would not squeal. The grinding generated clouds of dust that Flores inhaled while working in a room that measured roughly eight by ten feet.

Flores sued Borg-Warner and others, alleging that he suffered from asbestosis caused by working with brakes for more than three decades. At the week-long trial, Flores presented the testimony of two experts, Dr. Dinah Bukowski, a board-certified pulmonologist, and Dr. Barry Castleman, Ph.D., an "independent consultant in ... the field of toxic substance control." Dr. Bukowski examined Flores on a single occasion in May 2001. She reviewed Flores's x-rays, which revealed interstitial lung disease. Although there are more than 100 causes (including smoking) of such disease, Dr. Bukowski diagnosed Flores with asbestosis, based on his work as a brake mechanic coupled with an adequate latency period. According to Dr. Bukowski, asbestosis is "a form of interstitial lung disease, one of the scarring processes of the lungs caused from the inhalation of asbestos and found on biopsy to show areas of scarring in association with actual asbestos bodies or asbestos fibers."⁵ Dr. Bukowski noted that asbestosis can be fatal and is progressive, meaning that the scar tissue increases over time. Once inhaled, the fibers cannot be expelled, and there is no known cure for asbestosis. She asserted that Flores's asbestosis could worsen; that he could suffer

The "Flores" case was filed and tried to a jury before Chapter 90 was enacted in 2005. As such, it was not subject to the rigors of the Asbestos MDL under Judge Davidson.

Leg., R.S., ch. 97, § 2, 2005 Tex. Gen. Laws 169, 171–79 (now codified at TEX. CIV. PRAC. & REM. CODE ch. 90); see also STEPHEN J. CARROLL ET AL., RAND INSTITUTE FOR CIVIL JUSTICE, ASBESTOS LITIGATION 132 (2005). The trial in this case occurred before the statute was passed and was not, therefore, governed by its provisions.

2. Flores also performed brake jobs using Bendix, Raybestos, Motorcraft, Chrysler, and GM products.
3. From 1966 through 1972, Flores performed approximately three brake jobs per day. None of those involved Borg-Warner products.

4. Chrysotile asbestos is the most abundant type of asbestos fiber and is a serpentine fiber consisting of "pliable curly fibrils which resemble scrolled tubes." Lee S. Siegel, Note, *As the Asbestos Crumbles: A Look at New Evidentiary Issues in Asbestos Related Property Damage Litigation*, 20 HOFSTRA L. REV. 1139, 1149 (1992).

5. There was no biopsy performed on Flores's lung tissue, and Dr. Bukowski testified that, per criteria promulgated by the American Thoracic Society, biopsies are not necessary to an asbestosis diagnosis.

stiffening of his lungs, loss of lung volume, and difficulty with oxygenation. She acknowledged that everyone is exposed to asbestos in the ambient air; "it's very plentiful in the environment, if you're a typical urban dweller." She conceded that Flores's pulmonary function tests showed mild obstructive lung disease, which was unrelated to asbestos exposure.

Barry Castleman, Ph.D. testified that he has written numerous articles in peer-reviewed journals, as well as a book entitled *Asbestos: Medical and Legal Aspects*. Chapter 8, titled "Asbestos Disease in Brake Repair Workers," discusses asbestos-related risks to brake mechanics, "a long term interest of [his]" and reviews the published and some unpublished literature on asbestos as a hazard to brake mechanics. Dr. Castleman did not conduct independent research regarding the brake industry; instead, his research involved "look[ing] at what was publicly available." Dr. Castleman testified that "brake mechanics can be exposed [to asbestos] by grinding of brake pads or—or brake shoes and by—in the case of brake lining blowing out the accumulated dust in the brake—in the brake housing in doing a brake servicing/brake repair job." He described a conference on the hazards of brake repair held by Ford of Britain in 1969 and published in 1970 in the *Annals of Occupational Hygiene*. That conference evaluated the levels of exposure to asbestos fiber in the air from brake servicing jobs, and "it showed that the levels of exposure could be ... significant. They might not have necessarily exceeded the allowable exposure limits of the day, but in some cases, at least, they came close to doing that." Dr. Castleman then described some of the literature pertaining to

mechanics in particular: a 1965 article that reported a case of mesothelioma in a "garage hand and chauffeur"; information published by the National Institute for Occupational Safety and Health warning about dangers to brake mechanics, emphasizing that grinding of brake parts was a hazardous job with high levels of asbestos exposure; and a 1978 brochure published by the Friction Material Standards Institute (FMSI), "a vehicle for companies in that subgroup of the asbestos industry to avail themselves of knowledge relating to the hazards and government regulation of their products in the years following 1968," warning brake mechanics about the dangers of asbestos. The FMSI brochure led Dr. Castleman to conclude "that the hazards to brake mechanics were effectively accepted by the asbestos manufacturers— asbestos product manufacturers by that time."

Dr. Castleman testified that a 1968 article determined that "most of the asbestos in brake linings is destroyed by the heat of friction and therefore is not released to the public air as asbestos fiber." But "some of the asbestos was found to survive the heated friction of the braking process." When questioned about whether friable⁶ asbestos remained, Dr. Castleman testified that "[r]espirable asbestos fibers still remain," and a brake mechanic could be exposed to those fibers "[e]ither by grinding brake parts or by blowing out brake housings doing brake servicing work." On cross-examination, Dr. Castleman conceded that he had not researched Borg-Warner products and did not have any specific knowledge about them. While he knew that Borg-Warner manufactured brake pads, he did not "have any more detailed knowledge about the company than that."

6. "Friable" refers to breathable asbestos. See James L. Stengel, *The Asbestos End-Game*, 62

N.Y.U. ANN. SURV. AM. L. 223, 228 (2006).

Flores admitted to smoking from the time he was twenty-five until three weeks prior to trial. Flores's cardiologist reported a 50-pack year⁷ smoking history, greater than the 15 to 20-pack year history Flores reported to Dr. Bukowski. At the time of trial, Flores's chief medical complaint was shortness of breath, which he testified manifested itself primarily after he had been mowing the lawn for 35-40 minutes. Flores also suffers from coronary artery disease and high cholesterol.

Borg-Warner's expert, pulmonologist Dr. Kathryn Hale, examined Flores and testified that, in her opinion, he did not have asbestosis and that his x-rays did not show "any asbestos disease." She also testified that she had reviewed the literature, including epidemiological studies involving brake mechanics, and had not seen any articles indicating that auto mechanics suffered an increased risk of lung cancer or mesothelioma. She acknowledged that Flores's medical records included an x-ray report from a NIOSH certified B-reader⁸ physician who opined that Flores had "bilateral interstitial fibrotic changes consistent with asbestosis in a patient who has had an adequate exposure history and latency period," but Hale testified that she relied on criteria promulgated by the American Thoracic Society, and under those criteria, Flores did not have asbestosis.

7. A pack year is a way of measuring the amount a person has smoked over a long period of time. See NATIONAL CANCER INSTITUTE, DICTIONARY OF CANCER TERMS, http://www.cancer.gov/Templates/db_alpha.aspx?CdrID=306510 (all Internet materials last visited June 6, 2007 and copy available in clerk of court's file). It is calculated by multiplying the number of packs of cigarettes smoked per day by the number of years the person has smoked. *Id.*

The jury found that (1) Flores sustained an asbestos-related injury or disease; (2) Borg-Warner's negligence (as well as that of three other settling defendants) proximately caused Flores's asbestos-related injury or disease; (3) all four defendants were "engaged in the business of selling brake products"; and (4) the brake products had marketing, manufacturing, and design defects, each of which was a producing cause of Flores's injury. The jury apportioned to Borg-Warner 37% of the causation and 21% to each of the other three defendants. The jury awarded Flores \$34,000 for future physical impairment, \$34,000 for future medical care, \$12,000 for past physical pain and mental anguish, and \$34,000 for future physical pain and mental anguish.⁹ In the second phase of the bifurcated trial, the jury found, by clear and convincing evidence, that Flores's injury resulted from malice and awarded \$55,000 in exemplary damages against Borg-Warner. The trial court signed a judgment in conformity with the verdict, and Borg-Warner appealed.

The court of appeals affirmed, holding that there was legally sufficient evidence of negligence, citing the following:

- (1) Flores was a mechanic from 1964 to 2001;
- (2) as a mechanic, Flores ground new brake pads prior to installation, a process necessary to minimize "brake squealing";
- (3) the grinding process produced visible dust, which Flores inhaled;

8. A "NIOSH certified B-reader" refers to a person who has successfully completed the x-ray interpretation course sponsored by the National Institute for Occupational Safety and Health (NIOSH) and passed the B-reader certification examination for x-ray interpretation. See TEX. CIV. PRAC. & REM. CODE § 90.001(4) (defining the term).

9. Before the trial began, Flores withdrew his claims for past and future earnings, as well as loss of earning capacity.

(4) from 1972 to 1975, Flores ground brake pads manufactured by Borg-Warner; (5) Borg-Warner's brake pads contained between seven and twenty-eight percent asbestos by weight; (6) in 1998, Flores was diagnosed with asbestosis; (7) Dr. Castleman testified that brake mechanics can be exposed to asbestos by grinding brake pads, a process which produces "respirable asbestos fibers"; (8) Dr. Bukowski testified that "brake dust has been shown to ... have asbestos fibers"; and (9) Dr. Bukowski also testified that "brake dust can cause asbestosis."

153 S.W.3d 209, 213-214. Borg-Warner petitioned for review arguing, among other things, that a plaintiff claiming to be injured by an asbestos-containing product must meet the same causation standards that other plaintiffs do.¹⁰ We granted the petition. 49 Tex. Sup.Ct. J. 509 (Apr. 21, 2006).

II

Discussion¹¹

A

Causation

Perhaps the most widely cited standard for proving causation in asbestos cases is the *Lohrmann* "frequency, regularity, and proximity" test. *Lohrmann v. Pittsburgh Corning Corp.*, 782 F.2d 1156 (4th Cir. 1986); see also *Slaughter v. Southern Talc Co.*, 949 F.2d 167, 171 (5th Cir.1991) (noting that *Lohrmann* is "[t]he most fre-

quently used test for causation in asbestos cases" and applying *Lohrmann* to an asbestos claim governed by Texas law). In *Lohrmann*, the Fourth Circuit Court of Appeals considered whether a trial court correctly directed a verdict in favor of four asbestos manufacturers, after determining that there was insufficient evidence of causation between use of their products and the plaintiffs' asbestosis. *Id.* at 1162-63.

The appellate court noted that, under Maryland law, proximate cause required evidence that "allow[ed] the jury to reasonably conclude that it is more likely than not that the conduct of the defendant was a substantial factor in bringing about the result." *Id.* at 1162 (noting that section 431 of the Restatement (Second) of Torts uses the same "substantial factor" test). The court rejected a standard "that if the plaintiff can present any evidence that a company's asbestos-containing product was at the workplace while the plaintiff was at the workplace, a jury question has been established as to whether that product" proximately caused the plaintiff's disease, as such a rule would be "contrary to the Maryland law of substantial causation." *Id.* at 1163. Instead, the court concluded that "[t]o support a reasonable inference of substantial causation from circumstantial evidence, there must be evidence of exposure to a specific product on a regular basis over some extended period of time in proximity to where the plaintiff actually worked." *Id.* at 1162-63. The court noted that "[i]n effect, this is a *de minimis* rule since a plaintiff must prove more than a

A "de minimis" rule requires that a Victim's exposure to a Defendant's asbestos containing product be more than trivial.

10. Centerpoint Energy, Inc., The Coalition for Litigation Justice, Inc., The Dow Chemical Company, Eastman Chemical Company, Exxon Mobil Corporation, The Goodyear Tire and Rubber Company, Owens Illinois, Inc., and Union Carbide Corporation submitted amicus briefs.

11. We note initially that Borg-Warner did not challenge, either before trial or at the time the

evidence was offered, the reliability of Flores's experts and has, therefore, waived any reliability challenge that would require us to evaluate the experts' underlying methodology, technique, or foundational data. *Coastal Transp. Co. v. Crown Cent. Petroleum Corp.*, 136 S.W.3d 227, 231-33 (Tex.2004). Thus, we consider only those objections "restricted to the face of the record." *Id.* at 233.

casual or minimum contact with the product. This is a reasonable rule when one considers the Maryland law of substantial causation and the unusual nature of the asbestosis disease process, which can take years of exposure to produce the disease." *Id.* at 1162.

We have not adopted the *Lohrmann* test, and several amici urge us to do so here. The parties contend that our precedent adequately addresses the issue, as it requires that a party's conduct or product be a substantial factor in causing harm. We agree, with *Lohrmann*, that a "frequency, regularity, and proximity" test is appropriate, but those terms do not, in themselves, capture the emphasis our jurisprudence has placed on causation as an essential predicate to liability. It is important to emphasize that the *Lohrmann* court did not restrict its analysis to the tripartite phrase; indeed, it agreed that Restatement section 431 requires that the exposure be a "substantial factor" in causing the disease. *Id.* That analysis comports with our cases. For example, Restatement section 431's "substantial factor" test has informed our causation analysis on several occasions. *See Lear Siegler, Inc. v. Perez*, 819 S.W.2d 470, 471 (Tex.1991); *see also Union Pump Co. v. Allbritton*, 898 S.W.2d 773, 775-777 (Tex.1995). We have recognized that "[c]ommon to both proximate and producing cause is causation in fact, including the requirement that the defendant's conduct or product be a substantial factor in bringing about the plaintiff's injuries." *Union Pump*, 898 S.W.2d at 775. "The word 'substantial' is used to denote the fact that the defendant's conduct has such an effect in producing the harm as to lead reasonable men to regard it as a cause, using that word in the popular sense, in which there always lurks the idea of responsibility, rather than in the so-called 'philosophic sense,' which includes every one of the great number of

events without which any happening would not have occurred." *Lear Siegler*, 819 S.W.2d at 472 (quoting RESTATEMENT (SECOND) OF TORTS § 431 cmt. a (1965)). In asbestos cases, then, we must determine whether the asbestos in the defendant's product was a substantial factor in bringing about the plaintiff's injuries.

One of toxicology's central tenets is that "the dose makes the poison." BERNARD D. GOLDSTEIN & MARY SUE HENIFIN, *Reference Guide on Toxicology*, in FEDERAL JUDICIAL CENTER, REFERENCE MANUAL ON SCIENTIFIC EVIDENCE 401, 403 (2d ed.2000) (hereafter "REFERENCE MANUAL"). This notion was first attributed to sixteenth century philosopher-physician Paracelsus, who stated that "[a]ll substances are poisonous—there is none which is not; the dose differentiates a poison from a remedy." David L. Eaton, *Scientific Judgment and Toxic Torts—A Primer in Toxicology for Judges and Lawyers*, 12 J.L. & POLY 5 (2003) (citing CURTIS D. KLAASSEN, CASARETT AND DOULL'S TOXICOLOGY: THE BASIC SCIENCE OF POISONS Chs. 1, 4 (McGraw Hill 6th ed.2001) (1975)). Even water, in sufficient doses, can be toxic. REFERENCE MANUAL at 403; *see also* Marc Fisher, *Radio Stations and the Promotional Games: A Fatal Attraction*, WASH. POST, Feb. 25, 2007, at N02, available at <http://www.washingtonpost.com/wp-dyn/content/article/2007/02/23/AR2007022300456.html> (describing woman's death from water intoxication after participating in radio contest to win a video-game system).

Dose "refers to the amount of chemical that enters the body," and, according to one commentator, is "the single most important factor to consider in evaluating whether an alleged exposure caused a specific adverse effect." Eaton, *Scientific Judgment and Toxic Torts*, 12 J.L. & POLY at 11. We have recognized that "[e]xposure to asbestos, a known carcino-

gen, is never healthy but fortunately does not always result in disease." *Temple-Inland Forest Prods. Corp. v. Carter*, 993 S.W.2d 88, 95 (Tex.1999). We have held that epidemiological studies are without evidentiary significance if the injured person cannot show that "the exposure or dose levels were comparable to or greater than those in the studies." *Merrell Dow Pharms., Inc. v. Harner*, 953, S.W.2d 706, 720-21 (Tex.1997). The federal Reference Manual on Scientific Evidence provides:

An opinion on causation should be premised on three preliminary assessments. First, the expert should analyze whether the disease can be related to chemical exposure by a biologically plausible theory. Second, the expert should examine if the plaintiff was exposed to the chemical in a manner that can lead to absorption into the body. Third, the expert should offer an opinion as to whether the dose to which the plaintiff was exposed is sufficient to cause the disease.

Reference Manual at 419.

[1, 2] Dr. Castleman testified that, despite the heat generated by braking, "some asbestos," in the form of respirable fibers, remained in the brake pads, and that brake mechanics could be exposed to those fibers when grinding the pads or blowing out the housings. Flores testified that grinding the pads generated dust, which he inhaled. Dr. Bukowski testified that every asbestos exposure contributes to asbestosis. There is no question, on this record, that mechanics in the braking industry could be exposed to respirable asbestos fibers. But without more, this testimony is insufficient to establish that the Borg-Warner brake pads were a substantial factor in causing Flores's disease. Asbestosis appears to be dose-related, "so that the more one is exposed, the more likely the disease is to occur, and the higher the exposure the more severe the

disease is likely to be." See 3 DAVID L. FAIGMAN ET AL., MODERN SCIENTIFIC EVIDENCE: THE LAW AND SCIENCE OF EXPERT TESTIMONY § 28:22, at 447 (2007); cf. *id.* § 28:5, at 416 (noting that "it is generally accepted that one may develop mesothelioma from low levels of asbestos exposure").

While "[s]evere cases [of asbestosis] are usually the result of long-term, high-level exposure to asbestos, . . . '[e]vidence of asbestosis has been found many years after relatively brief but extremely heavy exposure.'" STEPHEN J. CARROLL ET AL., RAND INSTITUTE FOR CIVIL JUSTICE, ASBESTOS LITIGATION 13 (2005) (citing American Thoracic Society, *The Diagnosis of Nonmalignant Diseases Related to Asbestos: 1996 Update: Official Statement of the American Thoracic Society*, 134 AM. REV. RESPIRATORY DISEASE 363, 363-68 (1996)). One text notes that:

There is general agreement from epidemiologic studies that the development of asbestosis requires heavy exposure to asbestos . . . in the range of 25 to 100 fibers per cubic centimeter-year. Accordingly, asbestosis is usually observed in individuals who have had many years of high-level exposure, typically asbestos miners and millers, asbestos textile workers, and asbestos insulators.

Andrew Churg, *Nonneoplastic Disease Caused by Asbestos*, in PATHOLOGY OF OCCUPATIONAL LUNG DISEASE 277, 313 (Andrew Churg & Francis H.Y. Green eds., Williams & Wilkins 1998) (1988).

This record, however, reveals nothing about how much asbestos Flores might have inhaled. He performed about fifteen to twenty brake jobs a week for over thirty years, and was therefore exposed to "some asbestos" on a fairly regular basis for an extended period of time. Nevertheless, absent any evidence of dose, the jury could not evaluate the quantity of respirable asbestos to which Flores might have been

There is NO safe level of occupational exposure to asbestos with respect to Mesothelioma.

exposed or whether those amounts were sufficient to cause asbestosis. Nor did Flores introduce evidence regarding what percentage of that indeterminate amount may have originated in Borg-Warner products. We do not know the asbestos content of other brands of brake pads or how much of Flores's exposure came from grinding new pads as opposed to blowing out old ones.¹² There were no epidemiological studies¹³ showing that brake mechanics face at least a doubled risk of asbestosis. See *Merrell Dow Pharms., Inc. v. Havner*, 953 S.W.2d 706, 715 (Tex. 1997). While such studies are not necessary to prove causation, we have recognized that "properly designed and executed epidemiological studies may be part of the evidence supporting causation in a toxic tort case," and "the requirement of more than a doubling of the risk strikes a balance between the needs of our legal system and the limits of science." *Id.* at 717-

18. Thus, while some respirable fibers may be released upon grinding some brake pads, the sparse record here contains no evidence of the approximate quantum of Borg-Warner fibers to which Flores was exposed, and whether this sufficiently contributed to the aggregate dose of asbestos Flores inhaled, such that it could be considered a substantial factor in causing his asbestosis. *Union Pump*, 898 S.W.2d at 775; see also *Rutherford v. Owens-Illinois, Inc.*, 16 Cal.4th 953, 67 Cal.Rptr.2d 16, 941 P.2d 1203, 1219 (Cal.1997).

Thus, a literal application of *Lohrmann* leaves questions unanswered in cases like this. The evidence showed that Flores worked in a small room, grinding brake pads composed partially of embedded as-

bestos fibers, five to seven times per week over a four year period—seemingly satisfying *Lohrmann's* frequency-regularity-proximity test. Implicit in that test, however, must be a requirement that asbestos fibers were released in an amount sufficient to cause Flores's asbestosis, or the *de minimis* standard *Lohrmann* purported to establish would be eliminated, and the *Union Pump* causation standard would not be met. In a case like this, proof of mere frequency, regularity, and proximity is necessary but not sufficient, as it provides none of the quantitative information necessary to support causation under Texas law.

We recognize the proof difficulties accompanying asbestos claims. The long latency period for asbestos-related diseases, coupled with the inability to trace precisely which fibers caused disease and from whose product they emanated, make this process inexact. *Rutherford*, 67 Cal. Rptr.2d 16, 941 P.2d at 1218 (acknowledging that lengthy latency periods "mean that memories are often dim and records missing or incomplete regarding the use and distribution of specific products" and "[i]n some industries, many different asbestos-containing products have been used, often including several similar products at the same time periods and worksites"). The Supreme Court of California has grappled with the appropriate causation standard in a case involving alleged asbestos-related cancer and acknowledged the difficulties in proof accompanying such claims:

Plaintiffs cannot be expected to prove the scientifically unknown details of carcinogenesis, or trace the unknowable path of a given asbestos fiber. . . . [W]e

12. We note that any asbestos fibers Flores encountered when blowing out brake housings would not necessarily have been from Borg-Warner brake pads but from whatever brand of pads Flores was replacing.

13. Epidemiological studies examine existing populations to attempt to determine if there is an association between a disease or condition and a factor suspected of causing that disease or condition. *Havner*, 953 S.W.2d at 715.

The Supreme Court, in addition to frequent, regular and proximate exposure, requires a quantum of fibers in relationship to the calculation of an aggregate dose of asbestos.

can bridge this gap in the humanly knowable by holding that plaintiffs may prove causation in asbestos-related cancer cases by demonstrating that the plaintiff's exposure to defendant's asbestos-containing product in reasonable medical probability was a substantial factor in contributing to the aggregate dose of asbestos the plaintiff or decedent inhaled or ingested, and hence to the risk of developing asbestos-related cancer, without the need to demonstrate that fibers from the defendant's particular product were the ones, or among the ones, that *actually* produced the malignant growth.

Rutherford, 67 Cal.Rptr.2d 16, 941 P.2d at 1219.

Thus, substantial-factor causation, which separates the speculative from the probable, need not be reduced to mathematical precision. Defendant-specific evidence relating to the approximate dose to which the plaintiff was exposed, coupled with evidence that the dose was a substantial factor in causing the asbestos-related disease, will suffice. As one commentator notes, "[i]t is not adequate to simply establish that 'some' exposure occurred. Because most chemically induced adverse health effects clearly demonstrate 'thresholds,' there must be reasonable evidence that the exposure was of sufficient magnitude to exceed the threshold before a likelihood of 'causation' can be inferred." *Eaton*, 12 J.L. & Pol'y at 39. Dr. Bukowski acknowledged that asbestos is "plentiful" in the ambient air and that "everyone" is exposed to it. If a single fiber could cause asbestosis, however, "everyone" would be susceptible. No one suggests this is the case. Given asbestos's prevalence, therefore, some exposure "threshold" must be demonstrated before a claimant can prove his asbestosis was caused by a particular product.

In analyzing the legal sufficiency of Flores's negligence claim, then, the court of appeals erred in holding that "[i]n the context of asbestos-related claims, if there is sufficient evidence that the defendant supplied *any* of the asbestos to which the plaintiff was exposed, then the plaintiff has met the burden of proof." 153 S.W.3d at 213 (emphasis added). This analysis is much like that rejected by the *Lohrmann* court as "contrary to the Maryland law of substantial causation": "that if the plaintiff can present any evidence that a company's asbestos-containing product was at the workplace while the plaintiff was at the workplace, a jury question has been established as to whether that product" proximately caused the plaintiff's disease. *Lohrmann*, 782 F.2d at 1162. Instead, as outlined above, a plaintiff must prove that the defendant's product was a substantial factor in causing the alleged harm. *Union Pump*, 898 S.W.2d at 775.

We note too, that proof of causation may differ depending on the product at issue; "[i]n some products, the asbestos is embedded and fibers are not likely to become loose or airborne, [while] [i]n other products, the asbestos is friable." *In re Ethyl Corp.*, 975 S.W.2d 606, 617 (Tex.1998); see also *Gideon v. Johns-Manville Sales Corp.*, 761 F.2d 1129, 1145 (5th Cir.1985) (noting that "all asbestos products cannot be lumped together in determining their dangerousness"); *Hardy v. Johns-Manville Sales Corp.*, 681 F.2d 334, 347 (5th Cir.1982) (distinguishing between "airborne asbestos dust and fibers from thermal insulation" and other "products containing asbestos—in whatever quantity or however encapsulated"); *In re R.O.C. Pretrial*, 131 S.W.3d 129, 136–37 (Tex.App.-San Antonio 2004, no pet.) (noting that "the type of asbestos that causes asbestosis is 'friable' asbestos," and that the claimants "had the initial burden to show

that they were exposed to asbestos . . . in a form that is capable of causing injury from appellee's products"). We have recognized that "[t]his, of course, bears on the extent and intensity of exposure to asbestos," *Ethyl Corp.*, 975 S.W.2d at 617, two factors central to causation. We have described situations in which workers were "so covered with asbestos as to be dubbed 'the snowmen of Grand Central.'" *Temple-Inland*, 993 S.W.2d at 95. That is not the situation here, where the asbestos at issue was embedded in the brake pads. Dr. Castleman testified that brake mechanics could be exposed to "some" respirable fibers when grinding pads or blowing out housings, and Flores testified that the grinding generated dust.¹⁴ Without more, we do not know the contents of that dust, including the approximate quantum of fibers to which Flores was exposed, and in keeping with the *de minimis* rule espoused in *Lohrmann* and required by our precedent, we conclude the evidence of causation in this case was legally insufficient. *Lohrmann*, 782 F.2d at 1162; *Union Pump*, 898 S.W.2d at 775.

III

Conclusion

Flores alleged two claims: negligence and strict liability. Because each requires

14. The only other evidence possibly relating to causation was chapter 8 of Dr. Castleman's book, which the trial court admitted over Borg-Warner's hearsay objection. The chapter discusses a number of studies involving friction products and includes an annotated bibliography with short summaries of publications discussing potential asbestos hazards from friction product manufacture, fabrication, and replacement. Even considering chapter 8 in its entirety, the information it contains does not supply the missing link in the evidence here. The chapter consists of a five-page history of asbestos in friction products, as well as research and the government regulation thereof, followed by the annotated

proof of substantial-factor causation, both fail. See *Union Pump*, 898 S.W.2d at 775. We reverse the court of appeals' judgment and render judgment for Borg-Warner. TEX.R.APP. P. 60.2(c).

Justice O'NEILL did not participate in the decision.



G. Byron KALLAM, M.D.; Mary Angeline Finke, M.D.; The Medical Clinic of North Texas, P.A.; Obstetrical and Gynecological Associates of Arlington; Gerald Thompson, M.D.; and Family Health Care Associates, Petitioners,

v.

Sharon BOYD, Respondent.

No. 05-0027.

Supreme Court of Texas.

Argued Dec. 7, 2006.

Decided June 15, 2007.

Background: Patient filed a medical malpractice case against physicians and medi-

bibliography and several case reports of mesothelioma in brake repair workers. But nowhere does it quantify the respirable asbestos a brake mechanic like Flores might have inhaled or whether those amounts were sufficient to cause asbestosis. The chapter is silent on Borg-Warner products (although it does contain references to Bendix and General Motors), and it does not cite epidemiological studies showing a doubling of the asbestosis risk for brake mechanics. Thus, for the reasons outlined above, the information contained in chapter 8 does not provide evidence of causation, and we do not reach Borg-Warner's complaint that the trial court erred in admitting the evidence.