

Revised November 3, 1998

**UNITED STATES COURT OF APPEALS
FOR THE FIFTH CIRCUIT**

No. 97-40365

JOHN BARTLEY, MIKE RUCKER, CHRIS LUKER,
WALTER HENRY, and TIM HUMBER,

Plaintiffs/Appellees/Cross-Appellants,

PLANET INSURANCE COMPANY,

Intervenor Plaintiff/Appellee,

VERSUS

EUCLID, INC., et al.,

Defendants,

EUCLID, INC.

Defendant/Intervenor Defendant/Appellant/Cross-Appellee.

Appeals from the United States District Court
for the Eastern District of Texas

October 20, 1998

Before REAVLEY, DeMOSS and PARKER, Circuit Judges.

ROBERT M. PARKER, Circuit Judge:

The appeal in this diversity case challenges a jury verdict and resulting judgment awarding four plaintiffs a total of \$2.8

million, exclusive of prejudgment and post-judgment interest, on products liability and negligence theories against a manufacturer of coal hauling vehicles. The plaintiffs cross-appeal to challenge the jury finding that their own negligence contributed to their injuries. We affirm.

I. PROCEEDINGS

Between May and October 1994, plaintiffs John Bartley¹, Mike Rucker, Chris Luker, Walter Henry and Tim Humber sued Euclid and others asserting personal injury/products liability claims under Texas law. The suits were filed in federal court invoking diversity jurisdiction pursuant to 28 U.S.C. § 1332. In December 1995, the district court *sua sponte* consolidated these actions. Euclid's motions for summary judgment, challenging the admission of plaintiffs' expert testimony on the basis of *Daubert v. Merrell Dow Pharms., Inc.*, 509 U.S. 579 (1993), were denied, and the case was tried to a jury. The district court entered judgment on the jury's verdict which found, *inter alia*, that Euclid's coal haulers were defective; that both Euclid and the plaintiffs were negligent; and that the coal haulers caused injuries and damages to the plaintiffs.

II. FACTS

Euclid designs, builds, and markets heavy equipment including

¹John Bartley advised this court that he has settled his claim and withdrawn his appeal.

120-ton vehicles used for hauling coal at open pit coal mines. Initially, Euclid's coal haulers were built with the engine mounted in front of the operator's cab, which design was termed "long-nosed."² In the mid-1970's, a new design, termed "short-nosed" because its engine was moved back on the chassis so that it rested partially under the operator's cab, was introduced.³ The new design differed from the earlier model in other ways, including using a shorter wheel base, and a trailing arm suspension system with rubber struts instead of steel springs. The short-nosed coal haulers, which are the subject of this litigation, have better visibility from the driver's seat and better maneuverability, but a considerably rougher ride.

Plaintiffs, males ranging in age from 32 to 46 years, were all employees of Texas Utilities Mining Company ("TUMCO") and operated Euclid short-nosed coal haulers in the course and scope of their employment. They brought suit against Euclid claiming that they had sustained back injuries as a consequence of long term repetitious trauma and severe vibrations experienced while operating Euclid's short-nosed coal haulers.

III. ADMISSIBILITY OF EXPERT WITNESS TESTIMONY

a. Standard of review

Euclid contends that the district court abused its discretion

²Euclid's long-nosed coal hauler is model 208 LDT.

³Euclid's short-nosed coal hauler is model 322 NDT.

and violated its gate-keeping responsibilities under *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579 (1993) by admitting the plaintiffs' expert testimony. We review district court rulings on the admission of expert testimony for abuse of discretion. See *General Elec. Co. v. Joiner*, ___U.S.___, 118 S. Ct. 512, 517 (1997); see also *Moore v. Ashland Chemical, Inc.*, ___F.3d___ (5th Cir. 1998)(en banc).

b. District court ruling

Plaintiffs' experts fall into two categories. Dr. Charles Aprill, Dr. Richard Bunch and Dr. Kelvin Samaratunga had formal training in the medical and physical therapy fields and were called to testify concerning causation. Arthur Chaseling and Geoff McDonald have formal training in the field of engineering and were called to testify regarding alleged design defects and potential alternative designs. The district court specifically found that both groups possessed sufficient qualifications to be considered experts, that their proffered evidence was reliable and relevant and that the probative value of the evidence was not "substantially outweighed by any type of prejudice."

The district court first considered whether the experts satisfied the requirements set out by Federal Rule of Evidence 702 and *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579

(1993).⁴

The Federal Rules of Evidence provide:

Rule 702. Testimony by Experts

If scientific, technical, or other specialized knowledge will assist the trier of fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education, may testify thereto in the form of an opinion or otherwise.

The district court began its analysis by acknowledging that, under Texas law, plaintiffs' medical causation evidence, as well as the engineering evidence, are subject to the standards set out by the Supreme Court in *Daubert*.

The district court listed the non-exclusive *Daubert* factors which it applied: 1) whether a theory or technique can be or has been tested; (2) whether the theory has been subjected to peer review and publication; (3) whether a potential rate of error has been established; and (4) whether the theory is "generally accepted" within the scientific community. See *Daubert*, 509 U.S. at 593-94. The district court then cited *United States v. Downing*, 753 F.2d 1224 (3rd Cir. 1985) in support of three additional factors that the district court found instructive to a reliability

⁴In January 1997, when the district court ruled on this motion, the Fifth Circuit had not squarely addressed whether *Daubert* applied to "non-scientific" expert testimony. The district court noted that uncertainty, but found it to be of no consequence to the determination of the motion, because all of the experts satisfied the requirements of *Daubert*. The subsequent decision in *Watkins v. Telsmith, Inc.*, 121 F.3d 984 (5th Cir. 1997), holding that *Daubert* is not limited to "scientific knowledge," is therefore satisfied by the district court's analysis.

determination:(1) the existence of a body of literature dealing with a particular topic or technique; (2) the qualifications and professional stature of the witness in question; and (3) the relationship of the current theory to other methods of analysis.

c. Causation experts

Euclid specifically challenges the district court finding that Plaintiffs' causation experts offered reliable evidence.

Dr. Aprill, a medical doctor specializing in diagnostic radiology, evaluated Plaintiffs' spinal problems and researched the cause of those problems. Aprill's research involved comparing the Magnetic Imaging Resonance ("MRI") scans of 90 individuals who drove the coal haulers that are the subject of this case with the MRI scans of 80 back pain patients, age and sex matched to the hauler drivers. Aprill employed mainstream scientific research techniques to preclude bias in his conclusions. These included Aprill reading MRIs without knowing whether the scans were taken from hauler drivers or from the control group, as well as intraobserver reliability checks by which a colleague selected random MRIs for double readings without Aprill's knowledge. He also testified concerning the results of another study of endplate fractures conducted in Minneapolis, finding that the MRIs of 38% of asymptomatic Minneapolis subjects revealed broken endplates compared to 41% in his study.

Aprill concluded that the MRIs of the hauler driver group

demonstrated multiple endplate fractures at multiple levels in the dorsal and lumbar spines and that accelerated disc degeneration occurred more often and at more levels in the hauler driver group than in the comparable group of people with back pain. He termed this finding statistically significant. The multiple endplate fractures demonstrated by the coal hauler population suggested to Aprill that those individuals were subject to repetitive vertical compression resulting in fractured endplates. Aprill's opinions were supported by an article appearing in 1992 in *Clinical Biomechanics*, stating that exposure to whole body vibrations causes structural damage to the endplate and subchondral bone. Aprill stated that he found this "fingerprint" condition throughout the hauler driver population. Although endplate abnormalities are fairly common, the drivers had not only more end plate fractures than the control population, but also an uncommon distribution of these fractures. Specifically, Aprill testified that in mature human populations most injuries appear in the lumbar (lower back) region, with cervical (neck) injuries next and dorsal spine injuries a distant third. The number of dorsal injuries Aprill found in the hauler driver population was very unusual. Further, the control group included individuals who had exposure to other risk factors identified by Euclid as possibly causing Plaintiffs' back injuries, including being over-weight, smoking, and truck driving. However, the significant number and characteristic

distribution of injuries pointed to hauler driving as the single risk factor resulting in the "fingerprint" injuries which showed up in Aprill's study.

Dr. Samaratunga, the plaintiffs' treating neurosurgeon, relied partially on Aprill's MRI study for his conclusion that the endplate fractures were caused by whole body vibrations. Dr. Bunch, a physical therapist and ergonomics expert, testified that he had performed an ergonomic assessment of the coal haulers and concluded that the coal haulers contributed to the plaintiffs' injuries.

The district court, after reviewing the curriculum vitae of Dr. Aprill, Dr. Samaratunga and Dr. Bunch, found that each of these witnesses met the requirements of Rule 702 for designation as expert witnesses in this matter. In addition to the doctors' credentials, the court noted that there is a body of literature dealing with repetitive trauma back injuries, the doctors' theories can be tested, and that the methodology that the doctors used derived from other accepted methodologies. Based on these facts, the district court determined that the testimony was reliable under the standards set forth in *Daubert*.

Euclid attacks the district court's finding that these causation experts provided reliable testimony. First, Euclid contends that the "mere existence" of a body of literature on a given subject does not speak to the question of reliability.

Second, they point out that the qualifications and professional stature of a witness, standing alone, do not evidence reliability. Third, they complain that the district court's conclusion that the experts' theories are "derived from methodology which relates to other accepted methodologies" is not helpful in determining reliability. Finally, they list those *Daubert* factors which do not point to reliability in this case: the potential rate of error in the causation witnesses' work was not established, the "general acceptance" of their conclusions was not established, and Dr. Samaratinga was allowed to testify concerning causation, when his area of expertise was established as treatment of back pain, not etiology.

Given the broad discretion vested in trial courts to "keep the gate" for the purpose of admitting or excluding opinion testimony, we cannot say that the district court abused its discretion in this case. See *Moore v. Ashland Chemical, Inc.*, ___ F.3d ___ (5th Cir. 1998)(en banc). Euclid asserts that each factor, standing alone, may not have been enough to support the admission of opinion testimony. However, the district court considered the *Daubert* factors in the aggregate, and determined that, on balance, the experts' opinions were sufficiently reliable to merit admission into evidence and testing in the fire of cross examination and contrary evidence. We find that the district court did not abuse its broad discretion in that exercise. See *General Electric Co. v.*

Joiner, ___ U.S. ___, 118 S. Ct. 512, 517 (1997); see also *Moore v. Ashland Chemical, Inc.*, ___ F.3d___ (5th Cir. 1998)(en banc).

c. Liability experts

Although Euclid generally complains of the admission of testimony by liability experts McDonald and Chaseling, the only basis for the challenge advanced on appeal concerns the manner by which Chaseling measured the vibration levels in the coal haulers.

Euclid contends on appeal, as it did at trial, that it was inappropriate for Chaseling to measure the vibrations in the coal haulers by attaching an accelerometer to the metal frame below the seat. Chasling responded to that contention, testifying that, pursuant to International Standards Organization ("ISO") standards, it is permissible to measure the vibrations from the frame rather than from the seat as long as the transmission characteristics of the seat cushion are taken into account when calculating the actual vibration. Chasling testified further that he believed that measuring the vibration from the frame gave better comparable results from truck to truck because the condition of the seating material varies widely.

Euclid also complains that Chaseling turned on the accelerometer in 16-second bursts only when told to do so by people who were suing Euclid, gathering less than seven minutes of vibration data over a fifteen hour span of time, which resulted in vibration data that was unreliable. Chaseling explained during his

testimony that he was attempting to record vibration measurements when the hauler was in a loping mode. For this he relied on the input of the hauler drivers to advise him when they felt the machine phase into that mode.

The district court noted that, "[a]s a general rule, questions relating to the bases and sources of an expert's opinion affect the weight to be assigned that opinion rather than its admissibility and should be left for the jury's consideration." *Viterbo v. Dow Chemical Co.*, 826 F.2d 420, 422 (5th Cir. 1987). The question for the district court was whether the "analytical gap" between the causation opinion offered by the expert and the scientific knowledge and available data advanced to support that opinion is too wide. *Moore v. Ashland Chemical Inc.*, F.3d (5th Cir. 1998). Here the district court determined that it was not.

[T]hese witnesses' theories can be tested, their qualifications are adequate, literature exists dealing with common design principals and methodologies for testing such designs, and the methods from which these opinion were reached are related to other methodologies and theories in the area of engineering safety and design. In the Court's opinion, these factors render this evidence reliable under *Daubert*.

Memorandum Opinion and Order, January 2, 1997, at 6. We conclude that the district court did not abuse its discretion in finding that the expert testimony offered by Chaseling and McDonald was reliable and relevant and therefore admissible, and that it was within the province of the jury to weigh the credibility of that evidence in light of Euclid's criticism that Chasling's methods for

testing vibration levels yielded inaccurate results.

IV. SUFFICIENCY OF THE EVIDENCE

Euclid moved for judgment as a matter of law based on the insufficiency of the evidence to support the plaintiffs' products liability and negligence claims. The district court denied the motion. We review that ruling *de novo*, applying the same standards employed by the district court. See *Gutierrez v. Excel Corp.*, 106 F.3d 683, 686 (5th Cir. 1997). "All evidence with all reasonable inferences must be considered in the light most favorable to the nonmoving party." *Id.* Judgment as a matter of law should have been granted if there was "no legally sufficient evidentiary basis for a reasonable jury to find for" the plaintiffs on issues they bore the burden of proving. FED.R.CIV.P. 50(a).

The jury found that the preponderance of the evidence⁵ established that there were design and marketing defects in the coal haulers at the time they left the possession of Euclid that were a producing cause of the plaintiffs' injuries. The jury also found that the preponderance of the evidence established that negligence by both Euclid and the plaintiffs proximately caused the injuries in question. On appeal, Euclid challenges the sufficiency

⁵The district court instructed the jury that all claims in this case must be established by a preponderance of the evidence, which "means evidence that persuades you that the plaintiffs' claims are more likely true than not true." Charge to the Jury, at 11. Neither party challenges the district court's articulation of the applicable burden of proof.

of the evidence as to design defects, marketing defects, Euclid's negligence and causation.

a. Strict liability design defect

In determining whether a product is defectively designed, "the jury must conclude that the product is unreasonably dangerous as designed, taking into consideration the utility of the product and the risk involved in its use." *American Tobacco Co., Inc. v. Grinnell*, 951 S.W.2d 420, 432 (Tex. 1997). Liability for a design defect may attach even if the defect is obvious or apparent. *Turner v. General Motors Corp.*, 584 S.W.2d 844, 850 (Tex. 1979). Whether a product has a design defect is evaluated in the light of economic and scientific feasibility of safer alternatives. *Boatland of Houston, Inc. v. Bailey*, 609 S.W.2d 743, 756 (Tex. 1980).

We find no merit in Euclid's argument that the evidence is not sufficient to support the jury's verdict because plaintiffs' experts did not use the words "unreasonably dangerous." Although an expert may testify to an ultimate issue, such testimony is not required to support the jury's verdict. See FED.R.EVID. 704(a). Rather, we must look to all the evidence, drawing all reasonable inferences in favor of the plaintiffs in evaluating the sufficiency of the evidence. See *Crosthwait Equipment Co., Inc. v. John Deere Co.*, 992 F.2d 525, 528 (5th Cir. 1993).

Chasling testified that the vibration of the hauler violated

the health and safety thresholds of International Safety Organization ("ISO") Standard 2631.⁶ Under that standard, the hauler drivers should not be exposed to vibrations in excess of established levels for more than 1.6 hours in a 24 hour period. The plaintiffs were routinely exposed to vibrations in excess of ISO standards for a majority of their 8 to 12 hour shifts. It was not simply the intensity of the vibrations but the vector of forces caused by a combination of vertical and longitudinal vibrations that produced injury. Evidence supports a determination that the "geometry" of the short-nose haulers, i.e. the shorter wheel base and placement of the engine, caused the vibrations. Those vibrations were exacerbated by the substitution of rubber struts for the steel springs which had been used in the long-nose haulers. The evidence identified Euclid's own long-nose hauler as a safe, feasible alternative from both an engineering and economic perspective. Euclid focuses on evidence that the short-nose design was a response to user demand for better maneuverability and visibility, arguing that such demand made the older design obsolete and therefore non-feasible. While Euclid's line of reasoning was

⁶Euclid points out that the ISO standards are not laws nor regulations, but are voluntary consensus standards for evaluation. Therefore, they contend, without specifically challenging the admission of evidence concerning ISO standards, that their failure to comply with the standards is not relevant to the issues in this case. However, evidence concerning ISO standards was before the jury, and we conclude that such evidence was relevant and the jury was free to assign whatever weight to the evidence that they determined was appropriate.

certainly relevant, this court is not empowered to sit as a super jury, substituting its view for the jury's assessment of the weight and credibility to assign to the conflicting feasibility evidence. See *Gutierrez v. Excel Corp.*, 106 F.3d 683, 687 (5th Cir. 1997).

Based on the foregoing, we find that the evidence before the jury was sufficient to support its conclusion that the short-nosed coal haulers are unreasonably dangerous as designed.

b. Negligence: marketing defect, failure to warn.

Euclid challenges on appeal the jury's determination that there was a defect in the marketing of the coal haulers at the time these products left the possession of Euclid.

Under Texas law, negligence consists of four essential elements: (1) a legal duty owed to the Plaintiff by the Defendant; (2) a breach of that duty; (3) an actual injury to the Plaintiff; and (4) a showing that the breach was a proximate cause of the injury. See *Williams v. Southern Pacific Transp. Co.*, 804 S.W.2d 132, 138 (Tex. App.--Houston [1st Dist.] 1990, writ denied). While strict liability focuses on the condition of the product, negligence looks at the acts of the manufacturer and determines if it exercised ordinary care in designing and producing its product. *American Tobacco Co., Inc. v. Grinnell*, 951 S.W.2d 420, 437 (Tex. 1997).

A product may be unreasonably dangerous because of a defect in marketing. See *Caterpillar, Inc. v. Shears*, 911 S.W.2d 379, 382

(Tex. 1995). A defendant's failure to warn of a product's potential dangers when warnings are required is a type of marketing defect. See *id.* A manufacturer has a duty to warn if it knows or should know of the potential harm to a user because of the nature of its product. See *American Tobacco Co., Inc. v. Grinnell*, 951 S.W.2d 420 (Tex. 1997). Euclid contends that the evidence was insufficient to support the jury's verdict that the short-nosed haulers were unreasonably dangerous and that Euclid knew or should have known of a potential harm to users because of the nature of its product. Euclid does not dispute that it failed to warn plaintiffs of unreasonably dangerous characteristics of its short-nose haulers.

A manufacturer has a duty to test and inspect his product to uncover scientifically discoverable dangers before the product is sold. See *Owens-Corning Fiberglas Corp. v. Malone*, 916 S.W.2d 551, 562 (Tex.App.--Houston [1st Dist.], 1996, writ granted). A product must not be made available to the public without disclosure of those dangers that the application of reasonable foresight would reveal. See *id.* There is evidence in the record that Euclid never ride-tested the short-nosed hauler before placing it on the market. In 1978, after an Australian purchaser complained about the rough ride of its short-nosed hauler, Euclid performed some ride tests specifically on the Australian hauler and found the ride to be unacceptable. However, the short-nosed haulers were still not

tested by Euclid in accordance with ISO procedures or otherwise, even though Euclid's chief engineer admitted that he was aware of the ISO procedures for whole body vibration testing. Euclid made no design changes in response to the reports made after the Australian testing, and even canceled its Ride Improvement Program.

Further, there was evidence that Euclid knew or should have known that three people sustained injuries caused by the rough ride of the short-nosed hauler sold to the Australian mine. Euclid took the position that the complaints were limited to one machine in Australia. The district court admitted into evidence a letter which had been sent to Morgan Equipment, an authorized Euclid dealer, which referenced "3 recent injuries (1 compensatable) claimed to be caused by the rough ride of" the Euclid short-nosed hauler. The letter also references "representations by the union on driver discomfort...." Euclid contends that this is not evidence of Euclid's negligence because there is no evidence that anyone at Euclid saw the letter and because it is not clear that the injuries referred to in the letter were same type injuries experienced by plaintiffs in this case. Euclid acknowledges that they were aware that the Australian short-nosed hauler had an unacceptably rough ride⁷, but points to evidence that the

⁷John Stoneman, the managing director of Morgan Equipment Company, the Euclid dealer that sold the short-nosed hauler to the Australian mine, testified concerning the lengthy history of attempts by both Morgan and Euclid to determine the cause of and to remedy the ride problems in the Australian hauler.

Australian hauler was a "lemon," and that it was specially modified to the customer's specifications, operated on rougher roads, and that these differences between the Australian hauler and the Texas haulers excused Euclid from warning the Texas buyers about the Australia rough ride problems.

The trial record contains evidence upon which a rational jury could base a rejection of Euclid's position. Euclid entered into a contract with Battelle Laboratories in February 1978, later expanded in May 1978, under which Euclid would pay \$17,500 to Battelle to solve the "ride problem" in its short-nosed haulers. Euclid also initiated a Ride Improvement Program during 1978, which was later discontinued. These efforts, combined with the letter and the failure to test the equipment prior to marketing is sufficient to support the jury's conclusion that Euclid knew or should have known of the potential harm to users because of the rough ride problems of the short-nosed haulers.

c. Causation

Causation is an element of both the plaintiffs' strict products liability claims and their negligence claims. *See Union Pump Co. v. Allbritton*, 898 S.W.2d 773, 775 (Tex. 1995). Strict liability requires proof of a producing cause, while proximate cause is the test in negligence actions. *See General Motors Corp. v. Saenz*, 873 S.W.2d 353, 357 (Tex. 1993).

A producing cause is an "exciting or contributing cause which

in the natural sequence, produced the injuries or damages complained of." *Haynes & Boone v. Bowser Bouldin, Ltd.*, 896 S.W.2d 179, 181 (Tex. 1995).

Proximate cause, on the other hand, consists of both cause in fact and foreseeability. See *Union Pump Co. v. Albritton*, 898 S.W.2d 773, 775 (Tex. 1995). Cause in fact means that a defendant's acts or omissions were a substantial factor in bringing about a plaintiff's injury. *Id.* Foreseeability is satisfied by showing that the actor, as a person of ordinary intelligence, should have anticipated the danger to others by his negligent act. See *McClure v. Allied Stores of Tex., Inc.*, 608 S.W.2d 901, 903 (Tex. 1980). Foreseeability does not require the actor to anticipate the particular accident, but only that he reasonably anticipate the general character of the injury. See *El Chico Corp. v. Poole*, 732 S.W.2d 306, 313 (Tex. 1987).⁸

There need not be direct proof of causation. The jury may infer proximate cause from the surrounding circumstances. See *Mosley v. Excel Corp.*, 109 F.3d 1006, 1009 (5th Cir. 1997). If a negligent act actively aids in producing an injury, it need not be the sole cause, but it must be a concurring cause, and such as might reasonably have been contemplated as contributing to the

⁸Producing cause requires a lesser burden than proximate cause because it does not require foreseeability. *Purina Mills, Inc. v. Odell*, 948 S.W.2d 927, 935 (Tex.Civ.App. - Texarkana 1997, writ denied).

result. See *McClure*, 608 S.W.2d at 904. However, causation "must be established by probative evidence, not by mere conjecture or guess." *Gutierrez v. Excel Corp.*, 106 F.3d 683, 687 (5th Cir. 1997).

The question for this court is whether there was sufficient evidence to support the jury's conclusion that Plaintiffs' back injuries were, more likely than not, caused by driving Euclid's coal haulers. Of course, there is not a precise fit between science and the applicable legal burdens of proof. However, when the incidence of a disease or injury is sufficiently elevated due to exposure to a purported source of injury, a plaintiff can raise a fact question on causation by presenting evidence that he was exposed to that substance and exhibits the disease or injury. See *Merrell Dow Pharms., Inc. v. Havner*, 953 S.W.2d 706 (Tex. 1997), citing *Daubert v. Merrell Dow Pharms., Inc.*, 43 F.3d 1311, 1320 n. 13 (9th Cir. 1995)(on remand). The question remains what quantum of elevation is sufficient to satisfy the preponderance of evidence burden of proof. The Texas Supreme Court seemingly answered this question, holding that epidemiological evidence should show that the risk of an injury or condition in the exposed population was more than double the risk in the unexposed or control population. *Havner*, 953 S.W.2d at 716. However, an intermediate Texas appellate court subsequently addressing the *Havner* opinion takes the position that *Havner* did not "set any strict rules regarding

what types of evidence would be sufficient or not sufficient to support a finding of causation." *Minnesota Mining and Manufacturing Co. v. Atterbury*, ___ S.W.2d ___, ___ (Tex.App. -- Texarkana 1998)(1998 WL 436916 at *15). There is no requirement that a party must have reliable epidemiological evidence of a relative risk of 2.0 or greater. *Id.* Reliable evidence of relative risk less than 2.0 can be considered, but must be supported by other credible, reliable evidence of causation. *Id.* Further, epidemiological evidence with a relative risk of 2.0 or greater does not automatically pass a sufficiency review. *Id.*

Assuming, without deciding, that *Havner's* rule controls,⁹ the evidence before the jury more than satisfies the relative risk of 2.0 standard. According to Aprill's testimony, the plaintiffs' condition is revealed in their MRIs as a "fingerprint" of a characteristic number and distribution of end plate fractures which is essentially unique to hauler drivers. While 68% of the control

⁹*Havner* amounts to the Texas Supreme Court's definition of "more likely than not burden of proof." See *Havner*, 953 S.W.2d at 717. Arguably, the definition of the applicable burden of proof is procedural rather than substantive, and therefore controlled by federal rather than state law. See *Gasperini v. Center for Humanities, Inc.*, 518 U.S. 415, 426 (1996)(noting that classification of a law as "substantive" or "procedural" is "sometimes a challenging endeavor.") The Fifth Circuit has not weighed in on the question of whether evidence must show more than doubling of the risk to support a jury's finding of causation. The federal circuits which have considered the question have reached diverse results. See *Havner*, 953 S.W.2d at 716 (listing cases demonstrating the split). The parties neither briefed nor argued the issue, and it is not outcome determinative in this case. Therefore, we decline to reach it.

group exhibited some evidence of end plate fractures, none of those individuals exhibited the characteristic injuries found in 90% of hauler drivers, that is, a pattern of back pathology discernable from the number, severity and distribution of end plate fractures. While the test formulated in *Havner*, if applicable, requires incidence of "fingerprint" conditions in the hauler driver population double that of the control group, the evidence established that the fingerprint condition found in 90% of the hauler drivers existed in 0% of the control population. Aprill additionally testified that, on average, the hauler drivers had twice as many end plate fractures as the control group. Aprill explained to the jury that end plate fractures are caused by vertical compression stress on the spine. If a person falls and lands hard on his buttocks, this may cause an individual end plate to crack. Such injuries appear most often at the top of the lumbar spine. However, long-term exposure to whole body vibration causes multiple end plate fractures throughout the spine. The control group exhibited the former pattern of end plate fractures, while the hauler drivers exhibited the latter. This evidence is sufficient to support the jury's verdict on the issue of causation under the *Havner* standard.

V. STATUTE OF LIMITATIONS

a. The Texas Discovery Rule

In Texas, a personal injury action must be filed "not later

than two years after the day the cause of action accrues”
TEX.CIV.PRAC.&REM.CODE ANN. § 16.003(a). Generally, accrual occurs on
the date the plaintiff first becomes entitled to sue the defendant
based upon a legal wrong, even if the plaintiff is unaware of the
injury. *Zidell v. Bird*, 692 S.W.2d 550, 554 (Tex. App.--Austin,
1985, no writ).

The “discovery rule” is an exception to this general rule.
See Moreno v. Sterling Drug, Inc., 787 S.W.2d 348, 351 (Tex. 1990).
Under the Texas discovery rule, the accrual of a cause of action is
deferred in cases in which the alleged wrongful act and resulting
injury were inherently undiscoverable at the time they occurred but
may be objectively verified. *See S.V. v. R.V.*, 933 S.W.2d 1, 6
(Tex. 1996).

Euclid asserted at trial that the statute of limitations
barred the Plaintiffs’ claims and the issue was submitted to the
jury. The jury found that Plaintiffs failed to file their lawsuits
within two years of the date they first suffered injury. The jury
made an additional findings that 1) the plaintiffs filed their
lawsuits within two years of the date they first knew, or in the
exercise of reasonable diligence should have known, that their
injuries were caused by driving the coal haulers; 2) plaintiffs’
injuries were inherently undiscoverable; and 3) plaintiffs’
injuries were objectively verifiable.

b. Standard of Review

On appeal, Euclid challenges the sufficiency of the evidence to support the jury's finding regarding the inherently undiscoverable and objectively verifiable nature of the injuries. Like the sufficiency of the evidence issues on liability, we review this ground of error by considering all evidence, drawing all reasonable inferences in the light most favorable to the nonmoving party. *Gutierrez v. Excel Corp.*, 106 F.3d 683, 686 (5th Cir. 1997). We will reverse the denial of Euclid's motion for judgment as a matter of law if there was not substantial evidence "such that reasonable jurors might reach different conclusions..." *Id.* at 686-87.

c. Inherently undiscoverable injuries

An injury is "inherently undiscoverable" if it is by nature unlikely to be discovered within the prescribed limitations period despite due diligence. *S.V. v. R.V.*, 933 S.W.2d at 7. Euclid argues that because Plaintiffs were aware of a painful "back-slapping" sensation while driving the coal haulers, their injuries were immediately "discoverable." Plaintiffs counter that, in spite of the uncomfortable ride, they had no reason to suspect the insidious damage that was occurring within their spines. We conclude that the evidence was sufficient to support the jury's "inherently undiscoverable" finding. Repetitive trauma injuries like those at issue in this case are not readily susceptible to discovery at the time of a particular, individual contact. Rather,

the fractured endplates throughout the plaintiffs' spines which were discovered later, were "unexpected latent injur[ies] which were unknown and unknowable at the time of the traumatic event." See *Albertson v. T.J.Stevenson & Co., Inc.*, 749 F.2d 223, 233 (5th Cir. 1984).

d. Objectively verifiable injuries

Euclid contends that there is not legally sufficient evidence to support the jury's determination that the Plaintiff's injuries were objectively verifiable. Euclid relies on language from the Texas Supreme Court's opinion in *S.V. v. R.V.*, 933 S.W.2d 1 (Tex. 1996): "For the purpose of applying the discovery rule, expert testimony on subjects about which there is no settled scientific view . . . cannot provide objective verification of [alleged wrong and injury.]" *Id.* at 18. *S.V.* held that expert opinion regarding recovered memories of childhood sexual abuse could not meet the objective verifiability element for the Texas discovery rule. The court noted the lack of consensus in the scientific community concerning the reliability of recovered memory, *id.* at 17-18, but noted that expert opinion coupled with other evidence could provide the kind of verification required. *Id.* at 16.

Here, the jury heard evidence that plaintiffs suffered herniated intervertebral discs and degenerated spines, confirmed by recognized diagnostic testing. We hold that such evidence, which came in the form of testimony from medical experts, relying on long

accepted methods of reading and interpreting MRIs, is sufficient to support the jury's affirmative answer on the "objectively verifiable" nature of the injuries.

e. Limitation bar as to Appellee Humber

Euclid devotes a single sentence to its contention that a unique limitations argument bars the claim of Tim Humber because a doctor told him more than two years before he filed suit that repetitious trauma had compromised his back. However, the jury heard evidence that Humber's doctor had actually diagnosed a herniated disc and it was TUMCO that advised him to claim his injury was due to repetitive trauma disease so that an injury date could be established for workers' compensation purposes. Such evidence does not preclude a reasonable jury from finding that Humber discovered that he suffered a repetitive trauma injury less than two years before he filed suit or that his injury resulted from driving the coal haulers.

VI. PROPORTIONATE RESPONSIBILITY¹⁰

The district court reduced the award of damages to Plaintiffs as a consequence of the jury's findings concerning Plaintiffs'

¹⁰This issue is referred to in the record and in much of the precedential jurisprudence as "contributory negligence" or "comparative responsibility." Texas law was modified in 1995 to its present form which refers to the same concept as "Proportionate Responsibility." See TEX.CIV.PRAC.& REM. CODE ANN., Ch.33.

proportionate responsibility for their injuries.¹¹ A take nothing judgment was entered as to Rucker because his proportionate responsibility was found to be 70%. Plaintiffs filed a cross-appeal, arguing that there is insufficient evidence to support the jury's findings regarding their proportionate responsibility for their injuries and that they should have been granted a judgment as a matter of law on that issue.

a. Was the issue preserved for appellate review?

Initially, we must determine whether Plaintiffs preserved the right to appeal the jury's proportionate responsibility findings. Euclid contends that Plaintiffs failed to comply with the requirements of FED.R.CIV.P. 50, thus precluding our review of the sufficiency of the evidence to support the jury's verdict on this issue. Generally, sufficiency of the evidence is not reviewable on appeal unless a pre-verdict motion for judgment as a matter of law was made in the trial court at the conclusion of all the evidence.

¹¹Question No. 4. For each person or product found by you to have caused the injury, find the percentage caused by...

- b. Chris Luker 30
 Euclid, Inc. 70...
- c. Mike Rucker 70
 Euclid, Inc. 30...
- d. Walter Henry 50
 Euclid, Inc. 50...
- e. Tim Humber 40
 Euclid, Inc. 60....

See *McCann v. Texas City Refining, Inc.*, 984 F.2d 667, 671 (5th Cir. 1993). However, strict compliance with Rule 50 is not necessary so long as the purposes of the requirement have been satisfied. *Greenwood v. Societe Francaise De*, 111 F.3d 1239, 1244-45 (5th Cir.), *cert. denied*, 118 S. Ct. 558 (1997). "These purposes are met when the court and the [opposing party] are alerted to the grounds on which the [complaining party] contends the evidence is insufficient prior to the submission of the case to the jury." *Id.* at 1245.

In this case, the evidence closed shortly before noon on Thursday, January 30, 1997. The trial court then considered Euclid's motion for judgment as a matter of law and began work on the jury charge. After 6:00 p.m. the following day, after completing what the court termed its "informal charge conference" the court allowed the parties to go on the record with "comments, requested instructions, and objections." At that time, Plaintiffs objected orally, on the record, to the submission of contributory negligence to the jury on the ground that there was not legally sufficient evidence to support the submission of the evidence to the jury. The court overruled the objection. After the verdict was returned, Plaintiffs filed a "renewed" motion for judgment as a matter of law addressing the sufficiency of the evidence of contributory negligence.

It is undisputed that Plaintiffs failed to file a formal,

written, pre-verdict motion for judgment as a matter of law. However, we find that Plaintiffs' objection to the jury charge on sufficiency of the evidence grounds served as the functional equivalent of a formal pre-verdict motion. See *Greenwood*, 111 F.3d at 1245, n.7 & 8; see also *Wells v. Hico ISD*, 736 F.2d 243, 251-52 (5th Cir. 1984). The issue of sufficiency of the evidence on plaintiffs' proportionate responsibility is thus preserved for appellate review.

b. Sufficiency of the evidence on proportionate responsibility

Plaintiffs contend that there is no evidence that any of the Plaintiffs had an awareness of the cumulative trauma they were suffering as a result of their exposure to Euclid's coal haulers. Nor, they argue, is there any evidence in the record to indicate that any of the Plaintiffs should have had knowledge of the dangerous and unsafe nature of the vibration levels they were receiving while driving the coal haulers.

Euclid answers that the evidence supports findings that Plaintiffs were negligent and at least partially responsible for their alleged physical injuries and damages. Euclid points to evidence that the coal hauler, like any other vehicle, had a rougher ride when road conditions were bad and the driver was driving too fast. The record contains evidence that there was no reason for driving the haulers at top speed and in fact TUMCO management wanted its drivers to slow down. Further, there was

evidence that Rucker continued to smoke, though doctors had told him smoking aggravates his back injury.

Given evidence that the Plaintiffs knew the vibrations worsened based on the speed the haulers were driven and that the drivers drove the haulers faster than their employer recommended, we find sufficient evidence to support the proportional negligence findings of the jury. Further, the evidence is sufficient to sustain the jury's finding that Rucker was responsible for 70% of the negligence that resulted in his injuries, thereby precluding any obligation for Euclid to compensate him for his damages.

VII. JURY CHARGE

a. Euclid's challenge to the jury charge on the issue of causation

Concerning the causation element of Plaintiffs' negligence cause of action, the district court instructed the jury that

"[P]roximate cause" means that cause which in a natural and continuous sequence, unbroken by any new and independent cause, produces an event without which that event would not have occurred, and which event or some similar event should have been foreseen by a person in the exercise of ordinary care under the same or similar circumstances

The district court separately defined the causation element of the Plaintiffs' products liability cause of action:

"[P]roducing cause" as used in these instructions, means an efficient, exciting, or contributing cause, which in a natural and continuous sequence, produces the injury in question

Euclid complains that the district court did not accept its proposed jury instruction that in order to impose liability on

negligence or products liability claims, the jury must determine that Euclid's conduct was a substantial factor and a "but for" cause of the plaintiffs' injuries, citing *Texarkana Memorial Hosp., Inc. v. Murdock*, 946 S.W.2d 836 (Tex. 1997) and *Gutierrez v. Excel Corp.*, 106 F.3d 683, 687 (5th Cir. 1997).

This court has stated the standard of review for jury charge challenges:

First, the challenges must demonstrate that the charge as a whole creates substantial and ineradicable doubt whether the jury has been properly guided in its deliberations. Second, even if the jury instructions were erroneous, we will not reverse if we determine, based upon the entire record, that the challenged instruction could not have affected the outcome of the case. If the party wishes to complain on appeal of the district court's refusal to give a proffered instruction, that party must show as a threshold matter that the proposed instruction correctly stated the law.

Flores v. Cameron County, Tex., 92 F.3d 258, 262 (5th Cir. 1996)(internal quotation marks omitted).

Euclid complains that the jury charge did not adequately inform the jury that because the injuries claimed by the plaintiffs do not arise from any discrete event, the plaintiffs bear the burden of showing that the defect or negligence actually caused the injuries. We are not convinced that the charge as a whole, which employed language identical to the definitions provided in the Texas Pattern Jury Charges, creates substantial and ineradicable doubt whether the jury has been properly guided in its deliberations. We therefore will not disturb the verdict based on

Euclid's challenge to the jury instructions on causation.

b. Rucker's challenge to the jury charge

Rucker contends on cross-appeal that the district court abused its discretion by refusing to grant his request that the jury be instructed on the effect of its answers regarding proportional responsibility. Unlike Texas state courts, federal courts are free to tell juries the effect of their answers. *See Martin v. Texaco, Inc.*, 726 F.2d 207, 216 (5th Cir. 1985). The decision whether to instruct the jury on the effects of its answers is "a matter of discretion for the trial court." *Martin v. Texaco, Inc.*, 726 F.2d 207, 216 (5th Cir. 1984).

Rucker further complains that the trial court refused his requested special instruction that "a plaintiff's negligence, if any, in merely failing to discover a product defect or guard against the possibility of its existence cannot form the basis of an affirmative finding against a plaintiff on the issue of negligence." Rucker takes the position that the omission of these two instructions led to an incomplete and erroneous charge on Euclid's proportionate responsibility defense and affected the outcome of Rucker's case. Rucker alleges that, taken together, these two jury charge decisions by the district court amounted to error in the jury instructions that prejudiced the outcome of the case. *See Aero Int'l, Inc. v. United States Fire Ins. Co.*, 713 F.2d 1106, 1113 (5th Cir. 1983).

In *Perricone v. Kansas City Southern Rwy. Co.*, 704 F.2d 1376 (5th Cir. 1983), the district court gave a supplemental instruction which informed the jury that the Plaintiff would not recover any damages if the Plaintiff was found to be more than 50% negligent. This Court affirmed the giving of the supplemental instruction in the absence of contemporaneous objection. *Id.* at 1377. However, *Perricone* does not mandate the giving of such instructions. We find that the failure of the district court to instruct the jury on the effect of its answers concerning the Plaintiffs' proportionate responsibility in this case does not call into question the jury's factual determination that Plaintiffs were negligence and that their negligence was a producing cause of their injuries.

In a strict liability cause of action, a plaintiff's failure to discover or guard against a product's defect is not a defense to a defendant's liability. *See Keen v. Ashot Ashkelon*, 748 S.W.2d 91 (Tex. 1988). Therefore, Rucker's requested charge was a correct statement of the law in that regard. However, we are not left with substantial or eradicable doubt that the jury was properly guided in its deliberations. *See Flores*, 92 F.3d at 262. Both Plaintiffs and Euclid developed through evidence and argument before the jury their theories concerning proportionate responsibility of the Plaintiffs. We will not reverse the verdict because, based on the entire record, we do not conclude that the requested instructions would have affected the outcome of the case. *Id.*

VIII. CONCLUSION

Based on the foregoing, we affirm the district court's judgment.

AFFIRMED.

DeMOSS, Circuit Judge, dissenting:

I respectfully dissent. The plaintiffs in this case did not produce evidence that sufficiently demonstrates a causative link between their alleged injuries and Euclid's short-nose coal haulers. The district court abused its discretion by lowering the **Daubert** standard for admitting expert opinion testimony which was neither relevant nor reliable. Finally, this case should have been dismissed as time-barred because the plaintiffs' claims of injury, based on one doctor's subjective evaluation of MRIs, are not objectively verifiable as required under Texas case law governing the tolling of the statute of limitations pursuant to the discovery rule.

I.

Euclid, Inc., designs and manufactures 120-ton coal-hauling vehicles used at open pit coal mines. Before the mid-1970s, Euclid used a "long-nose" design. Like a pick-up truck, this design put the engine at the front, with the cab above and behind. Then, responding to consumer demands for greater driver visibility and maneuverability, Euclid and its competitors switched to "short-nose" designs. The new designs placed the driver in front, with the engine below and behind. This gives the front of the vehicle

a flat, snub-nosed appearance. Euclid's design changes included other modifications, including a shorter wheel base, a trailing arm suspension, and rubber struts instead of steel springs.

When the short-nosed design was introduced in the mid-1970s, Euclid sold several vehicles to Texas Utilities Mining Company (TUMCO). The five original plaintiffs in this case, males ranging in age from 32 to 46, are former TUMCO employees. They all operated the Euclid 322 NDT short-nose coal hauler. In addition, the plaintiffs also operated other heavy machinery in the coal pit, including bulldozers, scrapers, water trucks, and end-dump trucks.

The plaintiffs allege that they have suffered back injuries which resulted from "repetitious trauma and severe vibrations" experienced while operating the Euclid short-nose coal hauler. They sued Euclid, claiming that their back conditions were due to the Euclid short-nose coal hauler's defective design, which rendered the product unreasonably dangerous (the strict products liability claim), and Euclid's negligent design, marketing, and failure to warn customers and operators about safety risks pertaining to the short-nose coal hauler (negligence and gross negligence claims). Their suit was filed in the Eastern District of Texas, Marshall Division.

The sufficiency and admissibility of the testimony offered by the plaintiffs' expert witnesses lies at the heart of the controversy in this appeal. The plaintiffs' five testifying

experts have been divided by the panel majority into two categories -- two engineer "liability" experts who testified about the short-nose coal hauler and three medical "causation" experts who testified about the plaintiffs' injuries. Euclid sought summary judgment based on its contention that the plaintiffs' proposed expert testimony, necessary to establish causation and liability, could not be admitted pursuant to Fed. R. Evid. 702 and **Daubert v. Merrell Dow Pharmaceuticals, Inc.**, 509 U.S. 579, 113 S. Ct. 2786 (1993). Euclid's **Daubert** argument was rejected by the district court, but a continuing objection to identified expert testimony was permitted. Euclid also raised a limitations defense, but the district court determined that the discovery rule would apply.

Ultimately, a jury rendered a \$2.8 million verdict against Euclid. Euclid moved for judgment as a matter of law (JMOL) on the question of liability, all plaintiffs sought JMOL on Euclid's contributory negligence arguments, and plaintiff Tim Rucker, who received a take-nothing judgment because of the jury's determination that he was 70% contributorily negligent, moved for a new trial. These post-trial motions were denied. All parties timely appealed.

II.

A detailed discussion of the expert testimony offered at trial by the plaintiffs is necessary to the ensuing substantive

discussions. As previously mentioned, the experts fall into two general categories -- engineers who testified about the design and quality of ride of the short-nose coal hauler ("liability experts"), and doctors who testified about the plaintiffs' physical condition ("causation experts").

A.

The liability experts testified about Euclid's coal haulers. Mr. Geoff McDonald is an Australian engineer who had experience with the Euclid short-nose coal hauler dating back to 1977. Workers asked to operate a problematic Euclid short-nose coal hauler at the Blackwater Mine in Australia refused to operate it because its ride was so rough.¹² Mr. McDonald was asked to test the short-nose coal hauler at that time, and based on his testing in Australia, he testified that the long-nose haulers are safer because they are four to five times less likely to cause injury than the short-nose haulers.

Mr. Arthur Chaseling is a consulting mechanical engineer who also testified that he thought the long-nose design was safer. In 1996, Mr. Chaseling traveled with Mr. McDonald to Texas to test TUMCO's short-nose coal haulers. Mr. McDonald testified that the

¹² Euclid vigorously contests the probity of conclusions based on testing of a single hauler in Australia almost 20 years ago. Euclid contends that the haulers sent to Australia were specially modified to the customer's specifications. The company has also conceded that the hauler sent to Australia may have been a lemon.

mine operations and physical layout were similar to those at the Blackwater mine. Messrs. Chaseling and McDonald together measured the vibrations experienced by TUMCO's employees who operated the Euclid short-nose coal hauler. These tests were conducted by attaching an accelerometer to the metal frame below the seat of a Euclid coal hauler. Using these measurements, Mr. Chaseling determined that the Euclid short-nose coal hauler's vibrations exceed the health and safety limits of the International Standards Organization (ISO).¹³ Messrs. Chaseling and McDonald did not test any of the other earth-moving equipment operated at the mine to measure their vibrations, and they did not attempt any sort of comparison between the short-nose coal hauler and the other machines operated by the plaintiffs.

B.

The key causation expert was Dr. Charles N. Aprill, a medical doctor specializing in diagnostic radiology. He performed MRIs on the backs of approximately ninety TUMCO employees, including the plaintiffs, who operated the Euclid short-nose coal hauler. These employees also operated other heavy machinery such as scrapers, bulldozers, water trucks, and end-dump trucks,¹⁴ but Dr. Aprill's

¹³ The ISO standards are not binding on Euclid, and Euclid contests the probity of using these standards.

¹⁴ Plaintiff Johnny W. Bartley testified:

[T]here were several jobs that a hauler operator would

tests did not indicate that he had considered the effect of, or differentiated among the TUMCO employees based on, their length of employment or the amount of time they spent operating particular machines. He compared the results of these MRIs with a "control group" of MRIs performed on a group of "consecutive patients who were scanned roughly during the time these [TUMCO] patients were scanned, who were referred because they had some sort of back problem." The control group patients were selected to be age- and gender-matched to the test group of ninety TUMCO employees, but the control group did not include anyone who operated coal haulers or any other kind of earth-moving equipment.

Dr. Aprill found "endplate infractions" -- impact craters which form in an intervertebral disc when a load is applied to it -- in 90% of the TUMCO employees and in 68% of the "control group" of other back pain patients being treated by Dr. Aprill. He also found that while the endplate infractions occurring in the general

perform in hauler operator classification, of course, one being operate the hauler, another being to run the crusher, run the water truck and assorted pump duties, the dewatering type job whereupon rains you would pump water out of the pit to help dry it up. You were kind of a do-all individual.

All the other plaintiffs except Mike R. Rucker testified that they operated the same machines described by Mr. Bartley, as well as a bulldozer. Mr. Rucker had only begun driving the coal hauler for TUMCO in late 1990 or early 1991, and he testified that in addition to the coal hauler he also operated the water truck, end-dump truck, and a backhoe. During previous employment, Mr. Rucker had been a manual laborer, had operated other heavy machinery, such as a forklift, and had injured his back on the job.

back-pain population clustered between the lower dorsal spine and the upper lumbar spine, the TUMCO employees exhibited endplate infractions in that area as well as throughout the lumbar spine. According to Dr. Aprill, these endplate infractions render one more susceptible to back injury. Dr. Aprill concluded that the "repeated vertical compression" experienced by the TUMCO employees caused the endplate infractions.

On cross-examination, Dr. Aprill opined that for "the normal population without any occupational stresses," the incidence of endplate infractions is "something in the order of forty percent or so," and that "any person that's subjected to repetitive compression, whatever the source, is likely to develop changes similar to what we saw." Dr. Aprill stated that he had not compared the MRIs of the backs of short-nose coal hauler operators to test results for the operators of any other type of coal hauler; neither had he compared the MRIs of short-nose coal hauler operators to those of workers who operated bulldozers, end-dump trucks, scrapers, water trucks, or tractors. He further stated that he could not testify about the effect of operating those kinds of heavy equipment because he had "not seen MRI scans on large numbers of other heavy equipment operators." When challenged about his conclusions that the plaintiffs' endplate infractions were caused by the vibrations of the Euclid short-nose coal hauler, Dr. Aprill conceded that he could not point to any study which might indicate how much vibration was necessary to produce the injuries

he identified. His method and findings had not been reviewed by a statistician or an epidemiologist or submitted for peer review and publication, and no rate of error had been calculated for his theory. Furthermore, he had not conducted any prior research or studies -- nor had he submitted any papers or published any articles -- on vibration and its effects on the back.

Dr. Richard W. Bunch is a ergonomics consultant and physical therapist who rode in a Euclid short-nose coal hauler. Dr. Bunch used a pen and a pad of paper to keep track of the jerks and jolts that he felt during the ride. Based on his conclusions from this "semi-objective" field experiment, he testified that the vibrations experienced by the plaintiffs when they operated the Euclid short-nose coal hauler contributed to their injuries and that the design of the cab was not sufficient to protect the operator from the vibrations. Dr. Bunch's test was not subjected to peer review.

Dr. Kelvin A. Samaratunga is a neurosurgeon and a clinician who evaluates and treats back pain. He reviewed all of the previously described expert testimony, and he rode on a Euclid short-nose coal hauler. In particular, he reviewed the plaintiffs' medical records and MRIs. He testified that he agreed with Dr. Aprill that the endplate infractions were the result of whole body vibration, and that they would eventually lead to back problems for the plaintiffs. On cross-examination, Dr. Samaratunga conceded that he was not an expert on vibration and he had not performed any studies or published any materials in that field of study. He is

not an epidemiologist or a statistician either. When asked, Dr. Samaratunga indicated that he could not identify any published study which indicated that the levels of vibration measured in the short-nose coal haulers could cause the injuries of which the plaintiffs complained. The materials reviewed by Dr. Samaratunga did not address the effect, if any, of the other equipment operated in the mines by the plaintiffs.

III.

Euclid unsuccessfully moved for judgment as a matter of law based on the insufficiency of the evidence to establish a causative link between the plaintiffs' injuries and their operation of the Euclid short-nose coal hauler. De novo review applies, with inferences drawn in favor of the nonmoving party. See *Gutierrez v. Excel Corp.*, 106 F.3d 683, 686 (5th Cir. 1997).

A.

Texas law provides the substantive rule of what the plaintiffs were required to establish in order to prove Euclid's liability. The landmark decision of *Erie Railroad Co. v. Tompkins*, 304 U.S. 64, 58 S. Ct. 817 (1938), established that "[e]xcept in matters governed by the Federal Constitution or by Acts of Congress, the law to be applied in any case is the law of the State." 304 U.S. at 78, 58 S. Ct. at 822. Generally speaking, federal courts

sitting in diversity apply the substantive law of the state providing the law of decision, while following federal procedural law. See, e.g., *Gasperini v. Center for Humanities, Inc.*, 518 U.S. 415, 116 S. Ct. 2211, 2219 (1996). When the difference between applying state law and federal law is outcome-determinative, that factor is a strong indicator that the federal court should apply state law. See *id.* at 426-28, 116 S. Ct. at 2219-20; *Guaranty Trust Co. v. York*, 326 U.S. 99, 65 S. Ct. 1464 (1945). The test of outcome determination cannot, however, be applied mechanically; a federal court must instead be guided by "the twin aims of the *Erie* rule: discouragement of forum-shopping and avoidance of inequitable administration of the laws." *Gasperini*, 518 U.S. at 428, 116 S. Ct. at 2220 (quoting *Hanna v. Plummer*, 380 U.S. 460, 468, 85 S. Ct. 1136, 1142 (1965)).

Consistent with these principles, it is well established that in diversity cases, state law determines the quality and quantum of evidence that must be produced to establish a cause of action, while the standard for reviewing the sufficiency of evidence to sustain a jury verdict on appeal is indisputably governed by a federal standard. See, e.g., *Jones v. Wal-Mart Stores, Inc.*, 870 F.2d 982, 986 (5th Cir. 1989); *Tutor v. Ranger Ins. Co.*, 804 F.2d 1395, 1398 (5th Cir. 1986); *Ayers v. Sears, Roebuck & Co.*, 789 F.2d 1173, 1175 (5th Cir. 1986); *McCandless v. Beech Aircraft Corp.*, 779 F.2d 220, 223 (5th Cir. 1985); *Fairley v. American Hoist & Derrick*

Co., 640 F.2d 679, 681 (5th Cir. Unit A 1981). Federal law thus mandates that we review the jury's verdict by the same standard as the district court, affirming unless "there is no legally sufficient evidentiary basis for a reasonable jury to find" as the jury did. Fed. R. Civ. P. 50(a)(1); see **Denton v. Morgan**, 136 F.3d 1038, 1044 (5th Cir. 1998). The **Erie** doctrine, however, mandates that the object of this inquiry be whether the evidence adduced by the plaintiffs adequately establishes a prima facie case according to the laws of the state of Texas, such that the jury verdict may be approved.

This result is necessary both to discourage forum-shopping and to ensure the equitable administration of the laws. Were we to apply some lower standard -- essentially lowering the burden of proof -- products liability and negligence plaintiffs would have a considerable incentive to file suit in federal court rather than in state court because it would be easier for them to win a case. That is precisely what the **Erie** doctrine seeks to prevent. In this case, we must therefore consider whether the plaintiffs have proved, as a matter of Texas law, that their injuries were caused by the Euclid short-nose coal hauler.

B.

Under Texas law, causation in fact is an element of the both the plaintiffs' strict products liability claims and their

negligence claims. See, e.g., *Union Pump Co. v. Allbritton*, 898 S.W.2d 773, 775 (Tex. 1995).¹⁵ In order to establish this element, common to all their various claims that Euclid engaged in tortious activity, the plaintiffs must prove that vibrations produced by the short-nose coal hauler constituted "a substantial factor in bringing about the injury and *without which no harm would have occurred.*" E.g., *Havner v. E-Z Mart Stores, Inc.*, 825 S.W.2d 456, 458-59 (Tex. 1992) (emphasis supplied); *Nixon v. Mr. Property Management Co.*, 690 S.W.2d 546, 549 (Tex. 1985) (emphasis supplied); see also *Restatement (Third) of Torts: Products Liability* § 15 (1997) (hereinafter *Restatement (Third)*) ("Whether a product defect caused harm to persons or property is determined by the prevailing rules and principles governing causation in

¹⁵ As the Texas Supreme Court neatly summarized:

Negligence requires a showing of proximate cause, while producing cause is the test in strict liability. Proximate and producing cause differ in that foreseeability is an element of proximate cause, but not of producing cause. Proximate cause consists of both cause in fact and foreseeability. Cause in fact means that the defendant's act or omission was a substantial factor in bringing about the injury which would not otherwise have occurred. A producing cause is "an efficient, exciting, or contributing cause, which in a natural sequence, produced injuries or damages complained of, if any." *Common 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 Co., 898 S.W.2d 773, 775 (Tex. 1995) (emphasis supplied, citations omitted).

tort."). By requiring that the allegedly tortious activity be a factor "without which no harm would have occurred," the test embodies, as one of its elements, the "traditional 'but-for' rule of causation." 1 J. Hadley Edgar, Jr. & James B. Sales, *Texas Torts and Remedies* § 1.05[2][a], at 1-111 (1998); see also W. Page Keeton et al., *Prosser and Keeton on Torts* § 41, at 266 (5th ed. 1984) (hereinafter, *Prosser & Keeton*) ("Restricted to the question of causation alone, and regarded merely as a rule of exclusion, the 'but-for' rule serves to explain the greatest number of cases"); David W. Robertson, *The Common Sense of Cause in Fact*, 75 *Texas L. Rev.* 1765, 1768 (1997) (noting that the but-for standard is the "most widely accepted test" for determining cause in fact); *Restatement (Third)*, *supra*, § 15. That being the case, Texas law requires that the plaintiffs prove but-for causation with respect to the alleged injurious effect of the short-nose coal hauler; it is not sufficient for the plaintiffs to merely present evidence that the vibrations produced by the short-nose coal hauler constituted a "substantial factor" in producing the plaintiffs' injuries.¹⁶

¹⁶ Strictly speaking, the "substantial factor" inquiry is probative only in the event that "two causes concur to bring about an event, and either one of them operating alone, would have been sufficient to cause the identical result." *Prosser & Keeton, supra*, § 41, at 266. The plaintiffs have not argued that the Euclid short-nose coal hauler is one of several factors which would have independently caused their injuries, so we need not consider whether these facts fall into that special subset of cases.

C.

A five-step logical process provides a careful (if tedious) model for determining whether a given event is a cause in fact of a plaintiff's injuries. In summary, the five logical steps for proving but-for causation are as follows:

- (a) identify the injuries in suit;
- (b) identify the wrongful conduct;
- (c) mentally correct the wrongful conduct to the extent necessary to make it lawful, leaving everything else the same;
- (d) ask whether the injuries would still have occurred had the defendant been acting correctly in that sense; and
- (e) answer the question.

Robertson, *supra*, at 1771. The application of this framework of analysis will help to locate any logical flaw which may taint the plaintiffs' theory of causation.

The first step is to identify the plaintiffs' injuries. In this case, the plaintiffs have alleged that they have suffered endplate infractions in their spines which render them more susceptible to serious back pain in the future. The second step is to name the defendant's allegedly wrongful conduct. Because there are multiple answers at this second step relating to each of the plaintiffs' theories of liability, we must consider each theory separately.

1.

The plaintiffs have a strict products liability claim and a negligence claim based on defective design. The allegedly wrongful conduct for the purposes of both of these claims was negligent design of the short-nose coal hauler pursuant to Euclid's business decisions to stop manufacturing long-nose coal haulers and to begin manufacturing short-nose coal haulers. Because these separate claims focus on the same activity, they may be grouped for the purpose of determining whether that activity was a cause in fact of the plaintiffs' injuries.

Taking the third analytical step with respect to these claims, we must hypothesize a scenario that would erase the effect of the allegedly wrongful conduct. According to the plaintiffs' theory of their products liability case, the short-nose coal hauler subjects its operator to harmful vibration, rendering the machine defective and unreasonably dangerous.¹⁷ Similarly, in the negligence rather

¹⁷ "In Texas, section 402A of the *Restatement (Second) of Torts* governs claims for strict liability in tort." **American Tobacco Co. v. Grinnell**, 951 S.W.2d 420, 426 (Tex. 1997) (citing **Firestone Steel Prods. Co. v. Barajas**, 927 S.W.2d 608, 613 (Tex. 1996); **McKisson v. Sales Affiliates, Inc.**, 416 S.W.2d 787, 788-89 (Tex. 1967)). According to that rule:

(1) one who sells any product in a defective condition unreasonably dangerous to the user or consumer or to his property is subject to liability for physical harm thereby caused to the ultimate user or consumer, or to his property, if

(a) the seller is engaged in the business of selling such a product, and

than strict liability context, the plaintiffs additionally contend that the Euclid acted negligently in designing the short-nose hauler, such that the machine's operators were subjected to harmful vibrations, thus resulting in injury. In order to overcome the argument that the balance between "the utility of the product and the risk involved in its use" precludes liability on these theories, see, e.g., *American Tobacco Co. v. Grinnell*, 951 S.W.2d 420, 432 (Tex. 1997), the plaintiffs pointed to the older long-nose coal hauler as a safer alternative design which, they contend, did not suffer from the same defect.

For the purpose of these design-based theories, then, the third step of the analysis would be accomplished by trading the short-nose coal haulers for Euclid's older long-nose coal hauler models. The inquiry would then be completed by determining, at the fourth step, whether the plaintiffs' injuries would have occurred if they drove long-nose coal haulers and not short-nose coal haulers. If not, taking the fifth and final logical step, cause in fact has been established.

(b) it is expected to and does reach the user or consumer without substantial change in the condition in which it is sold.

Restatement (Second) of Torts § 402A (1965). "A product may be unreasonably dangerous because of a defect in marketing, design, or manufacturing." *Grinnell*, 951 S.W.2d at 426.

2.

Regarding the plaintiffs' remaining negligence and gross negligence claims, the allegedly wrongful conduct was a marketing defect, namely, Euclid's failure to warn customers and operators about safety risks arising from vibration in the short-nose coal hauler. The plaintiffs contend that such warnings would have allowed them to minimize their exposure to vibration and repetitive trauma while operating the short-nose coal hauler.

Removing the effect of the wrongful conduct to take the third logical step in this scenario, one must hypothesize a work environment in which TUMCO and its employees were warned about safety risks arising from the short-nose coal hauler's tendency to vibrate. One would therefore assume that precautions were taken to reduce or eliminate the exposure to vibration, either by TUMCO's refusal to buy Euclid's short-nose coal hauler, the plaintiffs' refusal to operate the machine, or perhaps some sort of prophylactic precaution such as a modification of the machine itself or of the employees' usage of the machine. Given this scenario, the fourth step leads to the question of whether the plaintiffs would have been injured in a work environment exactly the same as it actually was except that they were not exposed to unsafe vibrations in the short-nose coal hauler. If it can be proved that there would have been no injury in this scenario, cause

in fact will have been established for the plaintiffs' negligence claim against Euclid.

3.

Based on the above reasoning, the key logical step in both scenarios is the fourth step designated above, specifically, "whether the injuries that the plaintiff[s] suffered would probably still have occurred had the defendant behaved correctly in the sense indicated." Robertson, *supra*, at 1771. It is apparent that in order to establish Euclid's liability on theories of strict products liability or negligence, the plaintiffs were required to present evidence to prove one of the two factual causation scenarios. They could show either that similarly situated workers who operated long-nose coal haulers but not short-nose coal haulers would not experience the injuries experienced by the plaintiffs (products liability and design defect claims), or that similarly situated workers who operated all the machines operated by the plaintiffs except the short-nose coal hauler would not experience the injuries experienced by the plaintiffs (marketing defect or failure-to-warn claims). I now turn to those absolutely necessary links of causation.

D.

Our guiding star in considering whether the plaintiffs have adequately established causation to justify imposing liability upon Euclid should be the recent treatment of tort causation by the Supreme Court of Texas in *Merrell Dow Pharmaceuticals, Inc. v. Havner*, 953 S.W.2d 706 (Tex. 1997) (hereinafter, *Havner*).

In that case the court reversed a jury verdict in favor of plaintiffs who had claimed that use of the drug Bendectin caused a birth defect in their child. The central issue throughout the litigation was the reliability of the expert testimony offered to establish causation. Though the specific issue before the court was whether the Havners' evidence was scientifically reliable and constituted "some evidence" to support the plaintiffs' judgment, the circumstances of the case led the court to consider precisely what a plaintiff must establish to raise a fact issue of whether a drug caused an individual's birth defect. This prompted a discussion of some very fundamental issues relating to proving causation.

The court noted that causation in toxic tort cases can be discussed in terms of either general or specific causation:

General causation is whether a substance is capable of causing a particular injury or condition in the general population, while specific causation is whether a substance caused a particular individual's injury. In some cases, controlled

scientific experiments can be carried out to determine if a substance is capable of causing a particular injury or condition, and there will be objective criteria by which it can be determined with reasonable certainty that a particular individual's injury was caused by exposure to a given substance.

Havner, 953 S.W.2d at 714-15. In many toxic tort cases, however, direct experimentation cannot be done. As a result, there can be no reliable, direct evidence of specific causation. The court thus reasoned:

In the absence of direct, scientifically reliable proof of causation, claimants may attempt to demonstrate that exposure to the substance at issue increases the risk of their particular injury. The finder of fact is asked to infer that because the risk is demonstrably greater in the general population due to exposure to the substance, *the claimant's injury was more likely than not caused by that substance*. Such a theory concedes that science cannot tell us what caused a particular plaintiff's injury. It is based instead on a policy determination that when the incidence

of a disease or injury is sufficiently elevated due to exposure to a substance, someone who was exposed to that substance and exhibits the disease or injury can raise a fact question on causation.

Id. at 715 (emphasis supplied) (citing *Daubert v. Merrell Dow Pharms., Inc.*, 43 F.3d 1311, 1320 n.13 (9th Cir. 1995) (on remand from the Supreme Court)).

While *Havner* dealt with causation principles in the context of a toxic tort case, the underlying issues are compellingly similar to the problems of proving that the Euclid short-nose coal hauler caused the plaintiffs' injuries in this case. First, the plaintiffs in *Havner*, just like the plaintiffs in the instant case, brought a products liability suit based on theories of negligence, defective design, and defective marketing. Second, the Havners did not contend that all limb reduction birth defects are caused by Bendectin, and, likewise, the plaintiffs before us in this appeal recognize that not all endplate infractions are caused by driving Euclid's short-nose coal hauler. Finally, in *Havner*, as here, the only proof of causation offered by the plaintiffs was scientific expert testimony relating the results of studies on the association between the use of a product and certain injuries which allegedly resulted from that use.

The plaintiffs and the panel majority would prefer that this case be treated differently than *Havner*, asserting that the present litigation is nothing like the infamous Bendectin cases. Quite to the contrary, this case bears many similarities to that significant, trend-setting series of cases. An underlying premise in many toxic tort cases is that the plaintiff has suffered an injury, such as cancer, which may have occurred even if the plaintiff had not been exposed to the substance at issue. So too in this case, the plaintiffs claim that they have suffered an injury, endplate infractions, which may have occurred even if they had never operated the short-nose hauler. Furthermore, and very significantly, just as toxic tort causation (as a practical matter) usually cannot be established by exposing human subjects to the substance in question for testing purposes, direct experimentation cannot be done (or at least has not been done) to prove objectively that use of the short-nose coal hauler causes endplate infractions, and these plaintiffs are therefore left to attempt to prove their case using epidemiological (or, in this case, pseudo-epidemiological) studies. In these respects, the case *sub judice* is much more akin to a toxic tort case than a traditional personal injury case, and as such, we should not shy away from considering Texas law regarding toxic torts.

Because causation cannot be proved directly by the plaintiffs, the only remaining avenue available in tort law for the purpose of

proving causation is to demonstrate that their use of the short-nose coal hauler increased their risk of injury. In order to determine causation in these circumstances, the finder of fact must be guided by the "more likely than not" burden of proof.

Havner established as a matter of Texas law that the more likely than not burden of proof requires, in order to be probative of causation, that epidemiological studies must demonstrate more than a doubling of the risk of injury.¹⁸ The supreme court explained:

Although we recognize that there is not a precise fit between science and legal burdens of proof, we are persuaded that properly designed and executed epidemiological studies may be part of the evidence supporting causation in a toxic tort case and that there is a rational basis for relating the requirement that there be more than a "doubling of the risk" . . . to the more likely than not burden of proof.

¹⁸ Of course, **Havner** does not purport to require that, and we need not consider whether, epidemiological standards *must* be used to indirectly prove tort causation with scientific medical opinion testimony. It is certainly worthy of note, however, that this Court has previously stated: "While we do not hold that epidemiologic proof is a necessary element in all toxic tort cases, it is certainly a very important element." **Brock v. Merrell Dow Pharms., Inc.**, 874 F.2d 307, 313 (5th Cir. 1989).

Havner, 953 S.W.2d at 717. This same standard of causation applies to the scientific evidence adduced by the plaintiffs in this case. Even though the studies conducted by the plaintiffs' experts are not "epidemiological studies," the plaintiffs' studies seek to accomplish the same objective as an epidemiological study -- they attempt to explain the cause of the endplate infractions which their MRI studies show that the plaintiffs experienced. Indeed, the only reason why the plaintiffs' experts' studies are not epidemiological studies is because they were not conducted according to well-established standards for reliably conducting epidemiological inquiries.

A scientific study providing indirect scientific evidence of tort causation, standing alone, is not sufficiently probative of legal causation if it does not tend to show that the suspected cause is more likely than not the actual cause of an injury. In other words, such a study is not probative of causation if it fails to demonstrate that the suspected cause doubles the risk of injury as compared to the general population which was not exposed or subjected to the suspected cause.

E.

Assuming, arguendo, the admissibility of the plaintiffs' experts' testimony,¹⁹ the evidence of causation is insufficient to support a verdict of negligence or strict liability. The key flaw in the plaintiffs' evidence is that it fails to show that the plaintiffs' common injuries and exposure to the Euclid short-nose coal hauler are anything more than a coincidence.

Dr. Aprill's "study" revealed endplate infractions in 90% of the TUMCO employees and 68% of the "control group" of back pain patients. Based on this statistical comparison, it is apparent that any given back-pain patient most likely would have had the infractions even though he had not operated a Euclid short-nose hauler.²⁰ Likewise, it is apparent that the risk of endplate

¹⁹ For reasons explained later, the expert opinions were not admissible. See *infra* Part IV.

²⁰ The panel majority refers to ***Minnesota Mining & Manufacturing Co. v. Atterbury***, No. 06-97-00099-CV (Tex. App.--Texarkana July 31, 1998, n.p.h.) (not designated for publication), 1998 WL 436916 (hereinafter, **3M**), for the propositions that there is "no requirement that a party must have reliable epidemiological evidence of a relative risk of 2.0 or greater" and that "[r]eliable evidence of relative risk less than 2.0 can be considered, but must be supported by other credible, reliable evidence of causation." Majority Op. at Part IV(c) (citing **3M**, 1998 WL 436916, at *15). It is certainly true that the court in *Havner* did not impose a *requirement* that epidemiological evidence be used to prove causation, but that does not mean that epidemiological evidence that does not show a doubling of the risk may be used or that such evidence will support a jury's verdict.

The **3M** Court relied on ***Pick v. American Medical Sys., Inc.***, 958 F. Supp. 1151 (E.D. La. 1997), for the proposition that "epidemiological evidence with a relative risk lower than 2.0 should be considered because . . . it is relevant evidence." **3M**, 1998 WL 436916, at *15. Several things should be noted about the

infractions in the TUMCO employee test group is not more than twice the risk of endplate infractions in the control group. Plainly then, the statistics produced by the study do not tend to establish the plaintiffs' case. Cf. **Havner**, 953 S.W.2d at 717.

Moving beyond the statistical findings, however, the majority primarily rests its conclusions upon the so-called "fingerprint" of injury characteristics exposed by Dr. Aprill's subjective interpretation of the number and physical distribution throughout the spine of endplate infractions as exhibited in the plaintiffs' MRIs. Unfortunately, this "fingerprint" evidence is completely irrelevant because it bears absolutely no relation whatsoever to the links of causation that the plaintiffs are obligated to demonstrate. The "fingerprints" give us no guidance as to whether

Pick opinion. First, **Pick** is the opinion of a federal district court in Louisiana, applying Louisiana law to a products liability and negligence case arising from a claim that Mr. Pick's penile implant, designed and manufactured by the defendant, caused Mr. Pick to suffer from various health disorders which led to his eventual death. Our task in deciding diversity cases is to apply state law in the same fashion as we can best discern that the state supreme court would apply it. Although in deciding **3M** the Texarkana Court of Appeals relied on a decision of the United States District Court for the Eastern District of Louisiana, **Pick**, to inform its interpretation of an opinion of the Supreme Court of Texas, **Havner**, I am not persuaded that the Supreme Court of Texas would follow the same path. Second, **Pick** refers only to the *admissibility* of epidemiological evidence of relative risk above 1.0, not whether such evidence will support a jury verdict imposing liability. See **Pick**, 958 F. Supp. at 1160. In fact, the court in **Pick** granted summary judgment for the defendant based on the inadequacy of the plaintiffs' evidence to prove causation, and the plaintiffs' evidence in that case was not limited to epidemiological evidence. See **id.** at 1173.

the injuries would have occurred if the plaintiffs had operated long-nose coal haulers rather than short-nose coal haulers. Neither do the "fingerprints" demonstrate that the injuries would not have occurred absent exposure to the short-nose coal hauler. There is no proof that the level of vibration produced by the short-nose coal hauler was in any respect significantly different from the level of vibration generated by other heavy earth-moving equipment operated by the plaintiffs.²¹ In fact, Dr. Aprill conceded that he could not distinguish, based on his study, which of the many pieces of heavy machinery operated by the coal haulers might have been the cause of the endplate infractions. That is so, at least in part, because the study made no attempt to differentiate among its subjects based on their work histories, including what types of equipment the TUMCO employees had operated, and for what periods of time they operated that equipment. Dr. Aprill had no way to eliminate from his study the effects of other sources of vibration.

As explained earlier, *see supra* Part III(B), one of the above mentioned factual scenarios had to be established as a factual

²¹ Experts for Euclid, on the other hand, did test the other machines and found that, assuming that the vibration of these machines was a concern at all, other machines such as the bulldozer and the scraper presented a much greater concern for the operators than did the short-nose coal hauler. For the apparent purpose of demonstrating to the jury that the vibrations were not a serious concern, Euclid's experts also compared the short-nose coal hauler's vibrations to those generated by a Corvette and a Suburban driven around the courthouse square.

predicate to the plaintiffs' recovery.²² Without a tie to the particular injuries experienced by the plaintiffs, the opinions of Dr. Bunch and Dr. Samaratunga shift on their foundations. In essence, these two witnesses confirmed that the Euclid short-nose coal hauler vibrates, that vibrations can cause back injury, and that the plaintiffs who operated the short-nose coal hauler have indeed suffered back injury. They relied on Dr. Aprill's analysis to connect their knowledge about the machine and theories about whole body vibration to the plaintiffs' flesh and blood. Their testimony does not repair the fatal flaw in Dr. Aprill's testimony.

The liability experts' opinions that the Euclid short-nose hauler may subject its operators to injury due to prolonged exposure to harmful vibrations suffer from the same variety of logical flaw -- they are not linked to the specific injury claimed by the plaintiffs. Messrs. Chaseling and McDonald started with their measurements of the vibrations produced by the short-nose coal hauler. They then compared these findings to recommendations

²² An alternative, more formal logical explanation for the problem presented by this case may be that Dr. Aprill's reasoning suffers from the "fallacy of post-hoc statistics," which occurs when "[d]ifferences that are discovered by accident then become the verification of an ad-hoc hypothesis that was the result of the observation." Kenneth R. Foster & Peter W. Huber, *Judging Science: Scientific Knowledge and the Federal Courts* 143 (1997) (quoting Petr Skrabanek & James McCormick, *Follies and Fallacies in Medicine* (1990)). Dr. Aprill conducted his tests in 1995; Messrs. Chaseling and McDonald were summoned to Texas in 1996. It appears that the vibration theory was developed to support Dr. Aprill's analysis of the MRIs. "This is fallacious because it confuses pre- and post-test probabilities." *Id.* (quoting Skrabanek & McCormick, *supra*).

by the ISO concerning what amount of vibration may be acceptable. Having determined that the short-nose coal hauler's level of vibration is unacceptable according to ISO standards, these experts then reasonably opined that exposure to too much vibration can be harmful. All of this information is pertinent to the plaintiffs' claims, but none of it provides the answer to the ultimate question. None of it links the particularized information about the vibrations experienced by the plaintiffs in this case to the types of injuries experienced by the plaintiffs in this case. None of it eliminates other possible sources of vibration as the cause of the plaintiffs' injuries. Their testimony therefore does not permit the inference that the specific injuries claimed by the plaintiffs were caused by the Euclid short-nose coal hauler.

Simply put, nothing in the evidence presented by Dr. Aprill or any of the plaintiffs' other experts suggests the required *but-for* link between the short-nose hauler's vibrations and the incidence of endplate infractions in the plaintiffs' backs. Explained yet another way, even if Dr. Aprill's study demonstrates that the endplate infractions observed in the plaintiffs' backs are more likely than not attributable to some aspect of their occupation (which, as a matter of logic, is all that his studies could possibly demonstrate), the study does not link the Euclid short-nose hauler to the increased incidence of endplate infractions. The study does not distinguish the effects of the Euclid short-nose

coal hauler from the effects of any other kind of equipment operated by the plaintiffs. Moreover, a mere "blend" of expert opinions depicting a blurry relation resembling a causative link between Euclid's product and the plaintiffs' injuries is insufficient to support the verdict.²³ "Proof of causation cannot turn upon speculation or conjecture." *Leitch v. Hornsby*, 935 S.W.2d 114, 119 (Tex. 1996) (internal quotation marks omitted).

The plaintiffs showed that they and their coworkers operated the Euclid short-nose coal hauler. The plaintiffs demonstrated that the Euclid short-nose coal haulers vibrate, and that may be a bad thing. Finally, the plaintiffs explained that, in the opinion of Dr. Aprill, they and their coworkers have endplate infractions which appear in their spines in a unique fashion. But the plaintiffs did not establish the crucial logical link -- that it was the act of operating the short-nose coal haulers that caused their endplate infractions. That logical lapse should be fatal to their case. Because the plaintiffs have not presented evidence that establishes that operating Euclid short-nose coal haulers was a cause in fact of the plaintiffs' endplate infractions, Euclid should have been granted JMOL.²⁴

²³ This is a fair characterization of the testimony given by Dr. Samaratinga, who essentially provided an "expert" summarization of previously admitted expert testimony, apparently for the purpose of bridging the gaps and creating an illusion of logical cohesion.

²⁴ The panel majority is absolutely correct in its statement of law that if an "act actively aids in producing an injury, it need not be the sole cause, but it might be a concurring cause, and such

IV.

Euclid unsuccessfully sought to suppress the testimony of the plaintiffs' expert witnesses by challenging their qualifications to present expert opinion. Euclid now challenges on appeal the admission of plaintiffs' experts' testimony. This Court reviews for abuse of discretion. See *General Elec. v. Joiner*, 118 S. Ct. 512, 517 (1997); *Moore v. Ashland Chem. Inc.*, 151 F.3d 269, 274 (5th Cir. 1998) (en banc).

The Federal Rules of Evidence provide:

Rule 702. Testimony by Experts

If scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education, may testify thereto in the form of an opinion or otherwise.

The Supreme Court's decision in *Daubert* guides the application of Rule 702. As our Court recently summarized:

[W]hen expert testimony is offered, the trial judge must perform a screening function to ensure that the expert's opinion is reliable and relevant to the facts at issue in the case. See *Daubert*, 509 U.S. at 589, 113 S. Ct. at 2794-95. *Daubert* went on to make "general observations" intended to guide a district court's evaluation of scientific evidence. The nonexclusive list includes "whether

as might reasonably be contemplated as contributing to the result." Majority Op. at Part IV(c) (citing *McClure v. Allied Stores, Inc.*, 608 S.W.2d 901, 904 (Tex. 1980)). The fact that there may be multiple causes in fact for any given injury does not, however, eradicate the requirement of proving but-for causation in this case.

[a theory or technique] can be (and has been) tested," whether it "has been subjected to peer review and publication," the "known or potential rate of error," and the "existence and maintenance of standards controlling the technique's operation," as well as "general acceptance." 509 U.S. at 593-594, 113 S. Ct. at 2796-97.

Watkins v. Telsmith, Inc., 121 F.3d 984, 988-89 (5th Cir. 1997).

A.

The plaintiffs' experts' opinions that the Euclid short-nose coal hauler caused the plaintiffs' back injuries were inadmissible primarily because the substance of those opinions was not relevant as a matter of law. Rule 702 permits expert opinion testimony only in circumstances in which the opinion "will assist the trier of fact to understand the evidence or to determine a fact in issue." For all of the reasons stated in Part III of this dissent, which explained that the evidence was not sufficient to prove causation, the evidence was furthermore inadmissible under Rule 702 for the same reason. Because the substance of the expert opinion testimony did not tend to prove causation, it was inadmissible as a matter of law because it could not assist the jury. As the Supreme Court explained:

Faced with a proffer of expert scientific testimony, then, the trial judge must determine at the outset . . . whether the expert is proposing to testify to (1) scientific knowledge that (2) will assist the trier of fact to understand or determine a fact in issue. This entails a preliminary assessment of whether the reasoning or methodology underlying the testimony is scientifically valid

and of whether that reasoning or methodology properly can be applied to the facts in issue.

Daubert, 509 U.S. at 592-93, 113 S. Ct. at 2796 (footnotes omitted, emphasis supplied); see also ***Daubert v. Merrell Dow Pharms., Inc.***, 43 F.3d 1311, 1321 n.17, 1320-22 (9th Cir. 1995) ("Federal judges must therefore exclude proffered scientific evidence under Rules 702 and 403 unless they are convinced that it speaks clearly and directly to an issue in dispute in the case, and that it will not mislead the jury."); Kenneth R. Foster & Peter W. Huber, *Judging Science: Scientific Knowledge and the Federal Courts* 34-36 (1997); cf. ***Brock v. Merrell Dow Pharms., Inc.***, 874 F.2d 307, 311-15 (5th Cir. 1989).

Without belaboring the point, it should be sufficient to note the well-established requirement, grounded in Rule 702, that there be a "fit" between the opinions offered by an expert and some material issue in the case. If, as in this case, an expert's opinion is based on reasoning which as a matter of law is insufficient to support the expert's conclusion, that opinion should not be admitted into evidence because, as a matter of law, it cannot be helpful to the trier of fact and is therefore inadmissible.

B.

The plaintiffs' causation experts' testimony that the Euclid short-nose coal hauler caused the plaintiffs' back injuries was

also inadmissible because it was not scientifically reliable. In deciding Euclid's **Daubert** challenge, the district court acknowledged the factors provided by the Supreme Court, and then went on to list factors which it found compelling in this case: the witnesses' credentials; "a body of literature dealing with repetitive trauma back injuries"; the fact that the theories could be tested; and the fact that the "theories are derived from methodology which relates to other accepted methodologies."²⁵ These factors do not adequately ensure the reliability of the experts' opinions.

Though the Supreme Court expressly noted that **Daubert**'s list of factors is nonexclusive, it is certainly significant that the testimony of Dr. Aprill is plainly inadmissible under those original **Daubert** standards. The district court found that Dr. Aprill's hypothesis could be tested, but none of the other indicia of reliability are present. The theory has not, in fact, been tested. It has not been subjected to peer review or publication. No known or potential rate of error has been provided. There are no standards controlling the technique's operation. There is no suggestion that Dr. Aprill's method is generally accepted.

There is a good reason why almost none of the original **Daubert** criteria are satisfied by Dr. Aprill's methodology. It is that

²⁵ These supplemental factors were derived from **United States v. Downing**, 753 F.2d 1224 (3d Cir. 1985), a pre-**Daubert** decision.

there is an entire field of study devoted to the task which he attempted. "*Epidemiology* is the field of public health that studies the *incidence*, distribution, and etiology of disease in human populations and applies the findings to alleviate health problems." Linda A. Bailey et al., *Reference Guide on Epidemiology*, in *Reference Manual on Scientific Evidence* 123, 125 (Federal Judicial Center 1994) (emphasis in original). Dr. Aprill did not use epidemiological methodology to come to his conclusions; he generated a study for the purposes of this litigation and offered an opinion about what it shows. This is precisely the sort of ad hoc method of creating testimony that Rule 702 and **Daubert** exclude.

The factors relied upon by the district court essentially lower the **Daubert** bar. The court cited the witnesses' credentials, but plainly credentials are not enough. The court cited the presence of "a body of literature" dealing with the type of injuries claimed by the plaintiffs, but that factor completely swallows **Daubert**'s inquiry into peer review and publication. As Euclid points out, by that reasoning expert testimony about space alien abductions would also be admissible. Likewise, the district court's reference to the fact that the plaintiffs' experts' "theories are derived from methodology which relates to other accepted methodologies" simply lowers the standard set by **Daubert**'s reliance upon "general acceptance."

In sum, the factors cited by the district court in support of admitting the testimony of the plaintiffs' experts seriously weaken the standards of Rule 702 and *Daubert*. It was, therefore, an abuse of discretion to consider these factors and admit the testimony.

v.

With respect to all of the original plaintiffs except Mr. Johnny Bartley (who has since settled his claims against Euclid), the claims are barred by limitations unless the discovery rule applies. The jury found that the plaintiffs' injuries were inherently undiscoverable and objectively verifiable. These are the two prerequisites to applying the discovery rule under Texas law. See, e.g., *Childs v. Haussecker*, 974 S.W.2d 31, 36 (Tex. 1998); *Computer Assocs. Int'l, Inc. v. Altai, Inc.*, 918 S.W.2d 453, 456 (Tex. 1994).

In this case, it is very plain that the plaintiffs' injuries are not what the Supreme Court of Texas considers to be "objectively verifiable." "Expert testimony . . . d[oes] not supply the objective verification of wrong and injury necessary for application of the discovery rule." *S.V. v. R.V.*, 933 S.W.2d 1, 7 (Tex. 1996). Objective verification is a "higher level of certainty" than the mere preponderance of evidence required to find liability. Cf. *id.* at 19. For example, a sponge left inside a person by a surgeon is objectively verifiable. See *Gaddis v.*

Smith, 417 S.W.2d 577 (Tex. 1967). In the context of a charge of sexual abuse that was "discovered" after the alleged victim recovered repressed childhood memories, the Supreme Court listed the kinds of evidence that would qualify as objectively verifiable:

The kinds of evidence that would suffice would be a confession by the abuser, e.g. **Meiers-Post v. Schafer**, 170 Mich. App. 174, 427 N.W.2d 606, 610 (1988); a criminal conviction, e.g. **Petersen v. Bruen**, 106 Nev. 271, 792 P.2d 18, 24-25 (1990); contemporaneous records or written statements of the abuser such as diaries or letters; medical records of the person abused showing contemporaneous physical injury resulting from the abuse; photographs or recordings of the abuse; an objective eyewitness's account; and the like. Such evidence would provide sufficient objective verification of abuse, even if it occurred years before suit was brought, to warrant application of the discovery rule.

S.V., 933 S.W.2d at 15.

Here, as in **Robinson v. Weaver**, 550 S.W.2d 18 (Tex. 1977), "[e]ven the fact of injury is a matter of expert testimony." **Robinson**, 550 S.W.2d at 21 (quoted with approval in **S.V.**, 933 S.W.2d at 7). There was dispute among the experts at trial as to whether there is even such a thing as an "endplate infraction." The following dialogue occurred when Euclid cross-examined Dr. Aprill at trial about his interpretations of the plaintiffs' MRI scans:

Q Now, sir, isn't it true that the vast majority of the articles that either you've written alone or with other people, that the vast majority of these articles have two radiologists, or at least two radiologists, to look over the same scans that are

the subject of those articles in order to see if the radiologists agree with the interpretations?

A No, that is not true.

Q Well, sir, do you think that there's a problem or that there's something wrong about having work checked over to see if your interpretation of an MRI is the same as somebody else's?

A No, I don't.

Q Have you had a radiologist, other than yourself, look over your interpretations of these MRIs in order to see if they agree with what you said?

A No, I have not.

Q But radiologists other than you have reviewed these MRIs, have they not, sir?

A I don't know.

Q Have you not seen the reports done by Dr. Gallman, the chief of radiology at Schumpert Hospital, concerning your interpretation of these MRIs?

A I saw his review of the interpretation of five of the MRIs. There are 165 scans done, and I think he commented on five.

Q We are talking about the five Plaintiffs in this case, he commented upon those, did he not?

A Yes. Yes, he did.

Q And he disagreed with many of the things you said, did he not sir?

A Yes, he did.

Q And he disagreed with the importance that you placed on some of the things that you found, did he not, sir?

A Yes, he did.

Q And he disagreed with your opinions in this case, did he not?

A Yes, he did.

Q Would you agree with me, sir, that different radiologists have different styles interpreting MRIs?

A Yes, they do.

Q I want to show you a statement out of the "New England Journal of Medicine" . . . and ask if you agree with this. . . . "This new study is also a reminder that the interpretation of MRI findings can vary substantially so that the results may be equivocal despite the techniques or of infallibility. Thus, for example, Jensen, et al found that one expert neuroradiologist was 30 percent more likely to interpret a study as showing a disc protrusion than a second expert neuroradiologist reading the same films. This variation, although no worse than that for many other complex, clinical tests requiring expert interpretation, creates further opportunities for erroneous clinical decisions." Would you agree with that?

A Yes.

Q Some radiologists think certain things are abnormal and some don't, is that fair to say?

A Yes. Yes.

Q And there are a number of things that you claim are abnormal on the MRIs of these Plaintiffs here which other doctors do not think are abnormal; isn't that right, sir?

A I don't know that for a fact. The only person that I know that has commented on them is the doctor that you mentioned.

The point was illuminated when Euclid presented its case. A hospital's chief radiologist presented as an expert witness, Dr. William H. Gallman, III, had reviewed the plaintiffs' MRIs. He

testified that there was absolutely nothing unique or abnormal about them. He further commented that although his practice involved daily reviews and interpretations of MRIs, he had never seen or heard the term "endplate infraction," none of his colleagues had seen or heard it, and he believed that Dr. Aprill had fabricated the concept for the purpose of this litigation. The phenomenon referred to by Dr. Aprill as an endplate infraction is, in the opinion of Dr. Gallman, "extremely common," having "no significance" and seen "every day on multiple studies of different patients of all walks of life." Another of Euclid's experts, Dr. Malcolm Pope, distinguished professor in the Departments of Biomedical Engineering, Orthopedic Surgery, Preventative Medicine, and Mechanical Engineering at the University of Iowa, testified that endplate infractions are "not a widely accepted abnormality" and that "[s]ome radiologists would not even report it."

Where even the fact of injury is disputed, and contested expert testimony provides the only explanation for the cause of that injury, it is impossible to conclude that the injury is "objectively verifiable." The discovery rule is an exception to Texas statutes which otherwise limit the period of time in which plaintiffs may seek redress for injuries. The Supreme Court of Texas has made it clear that the discovery rule is not justified in cases where the injury cannot be demonstrated by clear physical evidence. The plaintiffs' claims in this case are time-barred

because they do not meet that high prerequisite to the application of the discovery rule.

VI.

For the foregoing reasons, the judgment of the district court should be reversed and judgment should be rendered in favor of Euclid. Accordingly, I dissent from the panel majority's contrary conclusion.