

EVIDENCE—SCIENTIFIC TESTIMONY—EPIDEMIOLOGICAL EVIDENCE
MAY BE USED TO ESTABLISH CAUSATION IN TOXIC TORT LITIGATION PROVIDED THAT THE APPLICABLE STANDARDS OF ADMISSIBILITY ARE MET—*Landrigan v. Celotex Corp.*, 127 N.J. 404, 605 A.2d 1079 (1992).¹

To establish a claim of negligence, a toxic tort plaintiff, like any other tort plaintiff, must prove that the defendant breached a duty of reasonable care and that the breach proximately caused actual loss or damage to the plaintiff.² In the past, tort plaintiffs relied largely upon expert testimony to establish the requisite causal connection between a defendant's conduct and a plaintiff's

¹ At the time *Landrigan* was decided, the original 1967 version of the New Jersey Rules of Evidence were in effect. Contemporaneously, however, the state legislature had considered and adopted, effective July 1, 1993, an amended version of the New Jersey Rules of Evidence designed to achieve greater uniformity with the Federal Rules of Evidence. Whenever a New Jersey Rule of Evidence is cited in this Note, the former text of the rule will be immediately followed by the text of the newly enacted rule. The former rules will be cited as "N.J. Evid. R." whereas the newly adopted rules will be cited as "N.J.R.E." See N.J.R.E. 1103, RICHARD J. BIUNNO, CURRENT NEW JERSEY RULES OF EVIDENCE (1993-94).

² See WILLIAM L. PROSSER ET AL., CASES AND MATERIALS ON TORTS 136 (8th ed. 1988). Section 4 of the Restatement (Second) of Torts provides:

The word "duty" is used throughout the Restatement of this Subject to denote the fact that the actor is required to conduct himself in a particular manner at the risk that if he does not do so he becomes subject to liability to another to whom the duty is owed for any injury sustained by such other, of which that actor's conduct is a legal cause.

RESTATEMENT (SECOND) OF TORTS § 4 (1966). Additionally, section 9 of the Restatement (Second) of Torts provides:

The words "legal cause" are used throughout the Restatement of this Subject to denote the fact that the causal sequence by which the actor's tortious conduct has resulted in an invasion of some legally protected interest of another is such that the law holds the actor responsible for such harm unless there is some defense to liability.

RESTATEMENT (SECOND) OF TORTS § 9 (1966). See generally 86 C.J.S. *Torts* §§ 6 (duty), 13 (breach), 21 (damages), 27 (proximate cause) (1954). See also *Dawson v. Chrysler Corp.*, 630 F.2d 950, 956 (3d Cir. 1980), *cert. denied*, 450 U.S. 959 (1981) (stating that New Jersey law will not hold a defendant liable in tort unless he owes the plaintiff a duty of care); *Pennsylvania Nat'l Turf Club, Inc. v. Bank of West Jersey*, 158 N.J. Super. 196, 203, 385 A.2d 932, 936 (App. Div. 1978) (stating that to be liable in tort a defendant must owe a duty to the plaintiff); *Caputzal v. The Lindsay Co.*, 48 N.J. 69, 74, 222 A.2d 513, 516 (1966) (explaining that the elements of a claim for negligence are duty, breach, proximate cause and damages); *Dalton v. Gesser*, 72 N.J. Super. 100, 112, 178 A.2d 64, 71 (App. Div. 1962) (articulating that a tortfeasor is liable only for the damages proximately caused by his unlawful conduct); *Pyle v. Fidelity Philadelphia Trust Co.*, 18 N.J. Misc. 54, 56, 10 A.2d 482, 484 (Atlantic County Ct. 1940) (asserting that a plaintiff's injury "must be predicated upon the violation, neglect or omission" of a defendant's legal duty).

injury.³ Proof of causation in toxic tort litigation, however, presents a unique problem.⁴ Because the symptoms of a toxic tort

³ KENNETH S. BROUN ET AL., MCCORMICK ON EVIDENCE § 2, at 3 (John William Strong ed., 4th ed. 1992) (stating that "[a]part from the ordinary eyewitnesses, it is increasingly necessary to arrange for the employment of technical experts, such as physicians in personal injury cases"). See generally 32 C.J.S. Evidence §§ 546(60) to 546(127), at 257-501 (1964) (discussing the function of skilled observers and experts and the subjects on which they testify); William E. Pipkin, Jr., *Expert Opinion Testimony: Experts, Where Did They Come From and Why Are They Here?*, 13 LAW & PSYCHOL. REV. 103 (1989) (providing an overview of the role that experts play in the litigation process). For a detailed discussion of the abuse of expert testimony in the legal system and safeguards within New Jersey law to prevent this abuse, see Barry M. Epstein & Marc S. Klein, *The Use And Abuse Of Expert Testimony In Product Liability Actions*, 17 SETON HALL L. REV. 656, 664-74 (1987).

Prior to the adoption of Federal Rule of Evidence 704, expert testimony addressing proximate cause was inadmissible, as a matter of law, because proximate cause is an ultimate issue. Daniel J. Steinbock, et al., *Expert Testimony on Proximate Cause*, 38 DEF. L.J. 539, 545 (1989). Expert opinion testimony pertaining to proximate cause was routinely excluded because it invaded the function of the fact-finder. *Id.* at 545-46. Recognizing that a jury could always choose to disregard an expert's testimony about proximate cause, however, courts began to systematically reject the ultimate issue rule. *Id.* at 546. In 1974, Federal Rule of Evidence 704 officially abolished the prohibition on ultimate issue testimony, thereby allowing experts to testify on proximate cause. *Id.* Nonetheless, the prohibition on ultimate issue testimony had merit. *Id.* at 562. Because proximate cause is a legal term of art, people outside the legal profession may not fully comprehend its meaning. *Id.* at 541-42. For instance, an expert may be well-equipped, by virtue of his specialized knowledge or training, to offer an opinion as to the cause-in-fact of an injury. *Id.* at 550. The expert, however, may have no understanding of proximate cause as a legal concept and therefore may lack any basis upon which to label an event the proximate cause of a particular injury. *Id.* at 552-53.

⁴ *Developments in the Law—Toxic Waste Litigation*, 99 HARV. L. REV. 1458, 1620 (1986) [hereinafter *Developments in the Law*]. See also Roy Alan Cohen & Jodi F. Mindnich, *Expert Testimony And The Presentation Of Scientific Evidence In Toxic Tort And Environmental Hazardous Substance Litigation*, 21 SETON HALL L. REV. 1009, 1010 (1991) (noting that the complex nature of toxic tort and environmental hazardous substance litigation requires attorneys to employ various specialized experts on science and medicine); Steve Gold, Note, *Causation in Toxic Torts: Burdens of Proof, Standards of Persuasion, and Statistical Evidence*, 96 YALE L.J. 376, 376 (1986) (acknowledging that toxic tort litigation poses unique judicial challenges, especially in establishing causation).

The New Jersey court system has devoted considerable attention to cases involving the level of proof required to establish an enhanced risk of developing a future injury due to toxic exposure. *Mauro v. Raymark Industries, Inc.*, 116 N.J. 126, 128, 561 A.2d 257, 258 (1989); *Ayers v. Jackson Township*, 106 N.J. 557, 577-79, 525 A.2d 287, 297-98 (1987). In *Mauro v. Raymark Industries, Inc.*, the plaintiff suffered pleural thickening as the result of occupational exposure to asbestos. *Mauro*, 116 N.J. at 128-30, 561 A.2d at 258-59. The plaintiff sued based upon his already diagnosed injury, the increased risk of developing cancer and the emotional distress created by that increased risk. *Id.* at 131, 561 A.2d at 259-60. The court recognized the plaintiff's right to recover damages for the initial physical injury and for any attendant emotional distress. *Id.* at 137, 561 A.2d at 263 (citing *Devlin v. Johns-Manville Corp.*, 202 N.J. Super. 556, 560-64, 495 A.2d 495, 497-99 (Law Div. 1985)). Further, the court

injury may remain latent and undiagnosed for years, ascertainment of the injury's origin seldom lends itself to traditional methods of proof.⁵ Moreover, it can be exceedingly difficult to establish a direct line of causation between a defendant's conduct and a plaintiff's injury because many people contract diseases, such as cancer, from non-tort related circumstances.⁶ As a result, plaintiffs have come to rely upon the testimony of scientific and medical experts who proffer evidence that is more sophisticated, but less particularized.⁷ In other words, a plaintiff who is unable to prove causation

acknowledged the plaintiff's ability to recover medical-surveillance damages, i.e., specific monetary damages measured by the cost of periodic medical examinations necessitated by the toxic exposure. *Id.* at 136-37, 561 A.2d at 263 (citing *Ayers*, 106 N.J. at 606, 525 A.2d at 312-13). The *Mauro* court, however, declined to determine whether a plaintiff not immediately injured by toxic exposure could recover emotional distress damages based on a rational fear of future injury. *Id.* at 137, 561 A.2d at 263. With regard to the enhanced risk claim, the court held that damages were not available unless the prospective disease was reasonably certain to occur. *Id.* at 139, 561 A.2d at 264. The majority noted that courts throughout the country have adopted this reasonable probability standard. *Id.* at 139-41, 561 A.2d at 264-65 (citing *Sterling v. Veliscol Chemical Corp.*, 855 F.2d 1188, 1204 (6th Cir. 1988); *Pollock v. Johns-Manville Sales Corp.*, 686 F. Supp. 489, 492 (D.N.J. 1988); *Sorenson v. Raymark Industries, Inc.*, 756 P.2d 740, 742 (Wash. Ct. App. 1988); *DeStories v. City of Pheonix*, 744 P.2d 705, 707 (Ariz. Ct. App. 1987); *Stites v. Sundstrand Heat Transfer, Inc.*, 660 F. Supp. 1516, 1524 (W.D. Mich. 1987); *Anderson v. W.R. Grace & Co.*, 628 F. Supp. 1219, 1231 (D. Mass. 1986); *Jackson v. Johns-Manville Sales Corp.*, 781 F.2d 394, 412 (5th Cir. 1986); *Larson v. Johns-Manville Sales Corp.*, 399 N.W.2d 1, 8 (Mich. 1986); *Haggerty v. L. & L. Marine Services, Inc.*, 788 F.2d 315, 319, *modified on other grounds*, 797 F.2d 256 (5th Cir. 1986); *Herber v. Johns-Manville Corp.*, 785 F.2d 79, 81-82 (3d Cir. 1986); *Devlin*, 202 N.J. Super. at 565, 495 A.2d at 500; *Eagle-Picher Indus., Inc. v. Cox*, 481 So. 2d 517, 520 (Fla. Dist. Ct. App. 1985); *Gideon v. Johns-Manville Sales Corp.*, 761 F.2d 1129, 1137 (5th Cir. 1985); *Wilson v. Johns-Manville Sales Corp.*, 684 F.2d 111, 119 (D.C. Cir. 1982)). For example, the *Mauro* court explained:

[T]he personal-injury plaintiff [with a bruised knee] conceivably could claim medical-surveillance damages and emotional-distress damages on the basis that the knee injury might cause arthritis, but could not recover damages for the prospective arthritic condition—for the “enhanced risk” of arthritis—unless its occurrence was established as a matter of reasonable medical probability.

Id. at 138, 561 A.2d at 264 (citing *Coll v. Sherry*, 29 N.J. 166, 174-75, 148 A.2d 481, 485-86 (1959)). Because the plaintiff's proof of the prospective development of cancer did not rise to the level of reasonable medical probability, the *Mauro* court held, the trial judge correctly withheld the plaintiff's enhanced-risk claim from the jury. *Id.* at 139, 561 A.2d at 264.

⁵ Gold, *supra* note 4, at 376; *see also Developments in the Law, supra* note 4, at 1618 (suggesting that toxic tort injuries do not lend themselves to particularized forms of proof).

⁶ *See* Bert Black & David E. Lilienfeld, *Epidemiologic Proof In Toxic Tort Litigation*, 52 *FORDHAM L. REV.* 732, 740 (1984).

⁷ Michael Dore, *A Commentary On The Use Of Epidemiological Evidence In Demonstrating Cause-in-Fact*, 7 *HARV. ENVTL. L. REV.* 429, 430 (1983). *See also* Gold, *supra* note 4, at 377 (observing that courts have increasingly allowed litigants to rely on epidemiol-

directly must establish it inferentially.⁸ This causal inference is created by demonstrating that the plaintiff falls within a class of people likely to have contracted a particular disease as a result of exposure to a toxic substance.⁹

The primary source of this type of evidence is epidemiology.¹⁰ Epidemiology studies the relationship between a disease and its causative factors.¹¹ An epidemiologist's analysis compares the inci-

ogy to establish causation). See, e.g., *In re Agent Orange*, 611 F. Supp. 1223, 1239-40 (E.D.N.Y. 1985), *aff'd*, 818 F.2d 194 (2d Cir. 1987), *cert. denied sub. nom. Lombardi v. Dow Chemical Co.*, 487 U.S. 1234 (1987) (noting that courts have begun to overcome their aversion to epidemiological evidence as a less particularized form of proof); *In re Swine Flu Immunization Products Liability Litigation*, 508 F. Supp. 897, 907 (D. Colo. 1981) (stating that "[w]here . . . the exact organic cause of a disease cannot be scientifically located, epidemiologic data becomes highly persuasive").

For a discussion of the types of scientific and medical experts toxic tort litigants typically utilize, see Cohen & Mindnich, *supra* note 4, at 1034-40.

⁸ See Dore, *supra* note 7, at 436.

⁹ Black & Lilienfeld, *supra* note 6, at 750.

¹⁰ *Id.* at 736. See also Richard J. Heafey, *Trial by Lottery: The Misuse of Epidemiology and Statistics to Prove Causation in Drug And Chemical Litigation*, 38 DEF. L.J. 673, 682-92 (1989) (analyzing the limits of statistical hypotheses based on epidemiology). For a thorough overview of epidemiology's role in the litigation process, see Cohen & Mindnich, *supra* note 4 and Black & Lilienfeld, *supra* note 6.

¹¹ Cohen & Mindnich, *supra* note 4, at 1035. There are three general categories of epidemiology: "(1) descriptive epidemiology; (2) analytic epidemiology; and (3) experimental epidemiology." 13 ARTHUR L. FRANK, M.D., PH.D., COURTROOM MEDICINE, *Cancer* § 3B.01 (Matthew Bender 1990) [hereinafter COURTROOM MEDICINE]. With regard to these categories, Dr. Frank explained:

Descriptive epidemiology refers to the study of the occurrence of disease in human populations based on the relationship between disease presentation and characteristics of the study population. These characteristics include age, sex, race, occupation, social class and in some studies geographical distribution.

. . . .

. . . After making descriptive observations of the possible relationships between exposure and development of disease, one generally moves on to analytic studies of the problem. Analytic studies are used either to test certain hypotheses generated by descriptive studies, or to answer a specific question (or questions) regarding the cause-and-effect relationship of exposure and disease. There are three types of general analytic studies, each of which has its usefulness in cancer epidemiology.

. . . (1) Cross-sectional studies (also called surveys or prevalence studies) consider a number of variables in a defined population at a specific point in time.

. . . (2) The case-control study is a relatively simple methodology that is especially useful for studying uncommon problems. One begins this type of study by identifying those individuals with the disease, i.e., the cases. One then looks to match these individuals to similar persons who do not have the disease, i.e., controls.

. . . (3) A cohort study (sometimes called an incidence study) dif-

dence of a disease in a population exposed to a potential causative agent with the incidence of the disease in an unexposed population.¹² The epidemiologist's ultimate goal is to reduce the observed data to a statistical inference that measures the strength of the causal association within the general population.¹³ The toxic tort plaintiff may then utilize the statistical correlation to establish the requisite causal link between the plaintiff's injury and the defendant's conduct.¹⁴

To accommodate the evolving needs of toxic tort plaintiffs, the New Jersey Supreme Court has been engaged in a decade-long, continual modification of the standard for admitting scientific evidence.¹⁵ Consistent with this trend, the supreme court held, in *Landrigan v. Celotex*,¹⁶ that epidemiological evidence can be utilized

fers from surveys and case control studies in that it directly examines factors related to the development of disease. One begins a cohort study with populations free of the disease and divides them into two groups. One group is exposed to the presumed carcinogen, the other is not, and development of the disease is observed over time in both groups.

....

... The experimental study differs from other epidemiological studies insofar as it permits direct manipulation of study populations and exposures and control over details such as study methodology and design.

Id. at §§ 3B.02-3B.04. For a more thorough discussion of the advantages and disadvantages of each of these studies, see *id.* at §§ 3B.01-3B.40.

¹² Black & Lilienfeld, *supra* note 6, at 750; Heafey, *supra* note 10, at 674; Cohen & Mindnich, *supra* note 4, at 1035. To accumulate data, epidemiologists conduct studies that are both retrospective and prospective in nature. Cohen & Mindnich, *supra* note 4, at 1035. In the retrospective study, an epidemiologist compares a group, whose members already demonstrate symptoms of a disease, to an unaffected control group in an attempt to discover a common factor that explains the disease's occurrence. *Id.* The prospective study monitors, over a particular time span, both an exposed and an unexposed control group, observing the incidence of disease in each. *Id.*

¹³ Black & Lilienfeld, *supra* note 6, at 750-51. Toxic tort litigants use epidemiological studies to prove that the development of a disease is statistically related to exposure to a toxic substance. Cohen & Mindnich, *supra* note 4, at 1035. A statistical inference arises by comparing the "expected mortality" rate (the disease mortality rate of the group unexposed to the toxic substance) with the "observed mortality" rate (the disease mortality rate of the group exposed to the toxic substance). *Id.* If these mortality rates relate in a one to one ratio, then the "relative risk" is 1.0. *Id.* When the "relative risk" is 1.0, the "attributable risk" is zero. *Id.* When the "relative risk" is 2.0, the "attributable risk" is greater than fifty percent. *Landrigan v. Celotex Corp.*, 127 N.J. 404, 419, 605 A.2d 1079, 1087 (1992).

¹⁴ Black & Lilienfeld, *supra* note 6, at 736; Cohen & Mindnich, *supra* note 4, at 1014.

¹⁵ *Landrigan*, 127 N.J. at 412-13, 605 A.2d at 1083 (citing *Rubanick v. Witco*, 125 N.J. 421, 593 A.2d 733 (1991); *Ryan v. KDI Sylvan Pools, Inc.*, 121 N.J. 276, 579 A.2d 1241 (1990)).

¹⁶ 127 N.J. 404, 605 A.2d 1079 (1992). On the same day that *Landrigan* was de-

to establish causation, provided that the evidence meets the applicable standards of admissibility.¹⁷ With regard to the standard of admissibility, the court explained that a trial judge should evaluate the reasonableness of the methodology employed by an epidemiological expert on a case-by-case basis.¹⁸

Thomas Landrigan died of colon cancer¹⁹ after a twenty-five

cided, the New Jersey Supreme Court delivered an opinion in *Caterinicchio v. Pittsburgh Corning Corp.* *Caterinicchio v. Pittsburgh Corning Corp.*, 127 N.J. 428, 431, 605 A.2d 1092, 1093 (1992). In *Caterinicchio*, a former pipefitter, insulator and line mechanic employed by the Exxon Bayway Refinery sued the manufacturers of the asbestos products that he had worked with for sixteen years. *Id.* The plaintiff, Peter Caterinicchio, was diagnosed with colon cancer in 1985. *Id.* At trial, the plaintiff presented two expert witnesses to testify that his colon cancer was caused by asbestos exposure. *Id.* at 432, 605 A.2d at 1093-94. One of the experts was a board certified physician in pulmonary and internal medicine. *Id.*, 605 A.2d at 1093. The other expert was an industrial epidemiologist and hygienist. *Id.* Both witnesses relied on the same epidemiological data as the expert witnesses in *Landrigan*, i.e., Irving Selikoff's landmark study. *See id.*; *see also Landrigan*, 127 N.J. at 418, 605 A.2d at 1086. As in *Landrigan*, the lower courts held that the epidemiologic testimony of both the medical doctor and the epidemiologist was inadmissible. *Caterinicchio*, 127 N.J. at 433-34, 605 A.2d at 1094; *Landrigan*, 127 N.J. at 411-12, 605 A.2d at 1083. Justice Pollock, writing for the New Jersey Supreme Court, reversed and remanded the matter to the trial court to be evaluated in accordance with the *Landrigan* standard. *Caterinicchio*, 127 N.J. at 434, 605 A.2d at 1095.

¹⁷ *Landrigan*, 127 N.J. at 417-18, 605 A.2d at 1086.

¹⁸ *Id.* at 421, 605 A.2d at 1088.

¹⁹ Colorectal cancer is one of the most prevalent cancers in the United States. COURTROOM MEDICINE, *supra* note 11, at § 11.45. Studies have indicated that approximately five percent of Americans will contract colon cancer. *Id.* This figure translates into roughly 100,000 new cases annually in the United States. *Id.* Although incidence of the disease has remained fairly constant over the last forty years, the position of the tumors has changed. *Id.* "Presently, approximately 75 per cent of large bowel carcinomas arise in the colon." *Id.*

Occurrence of the disease seems to have geographical implications. *Id.* Residents of the northeast are more likely to contract this form of cancer than Americans in the southern and western portions of the nation. *Id.* Age is also a strong factor in the development of colon cancer. *Id.* The disease occurs most frequently in the elderly, although individuals with a family history of the disease may be afflicted at a younger age. *Id.* "Overall, the average age at diagnosis is in the late sixties." *Id.*

Epidemiological studies, primarily on animals, have revealed that many chemical substances may produce colon cancer. *Id.* at § 11.44. None of these studies have, however, produced conclusive results. *Id.* Researchers have identified only one inducing agent that bears a definite relation to the development of the disease—asbestos. *Id.* Specifically, researchers have explained that

[i]ndustrial exposure to asbestos has been shown to increase the risk of developing colon cancer by some 2- or 3-fold. It is not clear if asbestos is functioning as a cancer-causing agent in and of itself, or if it is interacting with other cancer-causing agents that normally cause cancer in the colon. What is known, however, is that such exposure will lead to an increased risk. No other such associations have been clearly made to date.

Id.

year career as a maintenance man and pipe insulator.²⁰ Landrigan spent the first sixteen of those twenty-five years working with insulation containing asbestos.²¹ After his death, Landrigan's widow filed a survivorship and wrongful death action against the manufacturer and distributor²² of the insulation, alleging that the years of exposure to asbestos had caused the decedent's colon cancer.²³

At trial, the plaintiff offered two expert witnesses, neither of whom examined or treated the decedent, to establish the requisite causal link between Landrigan's occupational exposure to asbestos and his affliction with terminal colon cancer.²⁴ The first expert,

²⁰ *Landrigan*, 127 N.J. at 410, 605 A.2d at 1082. See COURTROOM MEDICINE, *supra* note 11, at § 26.11 (listing "pipe insulator" among the occupations that spawn asbestos exposure).

²¹ *Landrigan*, 127 N.J. at 410, 605 A.2d at 1082.

²² In *Landrigan*, the defendants were Owens-Corning Fiberglass Corporation, Owen Illinois, Inc. and The Celotex Corporation. *Id.* at 409, 605 A.2d at 1082. All actions have been stayed against the Celotex Corporation, however, because the corporation has filed for bankruptcy. *Id.* Therefore, the *Landrigan* court used the word "defendants" in reference only to Owens Illinois, Inc. and Owens-Corning Fiberglass Corporation. *Id.*

²³ *Id.* at 410, 605 A.2d at 1082. The plaintiff had originally intended to pursue both a strict liability and a negligence claim against the defendants. *Id.* In the strict liability claim, the plaintiff alleged that the defendants failed to warn Landrigan, during his years of employment, of the potential health hazards presented by asbestos exposure. *Id.* The basis of the plaintiff's negligence claim was that the defendants had breached their duty of care by failing to inspect the decedent's workplace for potential safety violations. *Id.* at 425, 605 A.2d at 1090. The trial court gave the plaintiff the option of proceeding under either the strict liability theory alone or "under a combined strict liability and negligence theory." *Id.* at 410, 605 A.2d at 1082. If the plaintiff chose to proceed on the strict liability theory, the defendants could not have availed themselves of the state-of-the-art defense. *Id.* The state-of-the-art defense would enable the defendants to claim ignorance of asbestos's dangerous side effects. *Id.* If the plaintiff chose to proceed on the combined theory, however, the defendants could avail themselves of the state-of-the-art defense. *Id.* The plaintiff elected to pursue the strict liability claim, thus precluding the defendants from utilizing the state-of-the-art defense. *Id.* On appeal, plaintiff challenged the lower court's direction to pursue only the strict liability theory. *Id.* at 423-24, 605 A.2d at 1089.

²⁴ *Id.* at 410-11, 605 A.2d at 1082-83. Plaintiff's experts were Dr. Joseph Sokolowski, Jr., a board certified physician in pulmonary and internal medicine, and Dr. Joseph K. Wagoner, a biostatistician and epidemiologist. *Id.* Dr. Wagoner is a widely recognized expert in asbestos-related diseases and has testified in a host of asbestos-related litigation. See, e.g., *Keene Corp. v. Gardner*, 837 S.W.2d 224, 229 (Tex. Ct. App. 1992) (testifying as to asbestos related disease); *The Celotex Corp. v. Wilson*, 607 A.2d 1223, 1226-27 (Del. Super. Ct. 1992) (testifying as to the risk of asbestos-related cancer); *Millison v. E.I. du Pont de Nemours*, 226 N.J. Super. 572, 578, 545 A.2d 213, 216 (App. Div. 1988) (testifying as to asbestos-related pleural thickening in the lungs); *In re Asbestos Litigation*, 1988 WL 77737, at *1 (Del. Super. Ct. June 28, 1988) (testifying as to the prevalence of disease among workers exposed to asbestos); *Brisboy v. Fibreboard Corp.*, 418 N.W.2d 650, 652 (Mich. 1988) (testifying as to asbestos-related lung cancer); *Lee v. A.C. & S. Co., Inc.*, 542 A.2d 352, 353, 356 (Del. Super. Ct. 1987) (barring Wagoner from testifying as to the cause of plaintiff's asbestos related death);

Dr. Sokolowski, a certified physician, based his opinion primarily upon epidemiological findings.²⁵ These findings indicated that one out of every three victims of colon cancer previously exposed to asbestos contracted the cancer because of that exposure.²⁶ After considering and then eliminating other risk factors, Dr. Sokolowski concluded that asbestos exposure was the cause of the decedent's colon cancer.²⁷

Following a Rule 8 evidentiary hearing,²⁸ the court deter-

Steinfurth v. Armstrong World Indus., 500 N.E.2d 409, 410 (Ohio Com. Pl. 1986) (testifying as to the point at which a manufacturer has a duty to give adequate warning of the unsafe nature of its products to the foreseeable user).

At the time *Landrigan* was decided, New Jersey Rule of Evidence 19 set forth the standard for assessing whether an expert was qualified to testify in courts of the state. N.J. Evid. R. 19 (1967), RICHARD J. BIUNNO, NEW JERSEY RULES OF EVIDENCE (1993). Rule 19 provided:

As a prerequisite for the testimony of a witness there must be evidence that he has personal knowledge of the matter, or experience, training, or education, if such be required. Such evidence may be provided by the testimony of the witness himself. The judge may reject the testimony of a witness that he perceived a matter if he finds that no trier of fact could reasonably believe that the witness did perceive the matter. In exceptional circumstances the judge may receive the testimony of the witness conditionally, subject to the evidence of knowledge, experience, training or education being later supplied in the course of the trial.

Id.

Rule 19 has been replaced by New Jersey Rule of Evidence 602, which states:

Except as otherwise provided by Rule 703 (bases of opinion testimony by experts), a witness may not testify to a matter unless evidence is introduced sufficient to support a finding that the witness has personal knowledge of the matter. Evidence to prove personal knowledge may, but need not, consist of the testimony of the witness himself.

N.J.R.E. 602, RICHARD J. BIUNNO, CURRENT NEW JERSEY RULES OF EVIDENCE (1993-94). With regard to expert testimony, the new text of the rule clearly refers the practitioner to Rule 703. REPORT OF THE SUPREME COURT COMMITTEE ON THE RULES OF EVIDENCE, reprinted in 129 N.J.L.J. 1, 23 (October 10, 1991) [hereinafter COMMITTEE REPORT].

²⁵ *Landrigan*, 127 N.J. at 410-11, 605 A.2d at 1082. Dr. Sokolowski based his opinion on the landmark study of Dr. Irving Selikoff. *Id.* at 418, 605 A.2d at 1086 (citing Irving Selikoff et al., *Mortality Experience of Insulation Workers in the United States and Canada*, 330 ANNALS N.Y. ACAD. SCI. 91 (1979)).

²⁶ *Id.*

²⁷ *Id.* at 411, 605 A.2d at 1082.

²⁸ At the time *Landrigan* was decided, New Jersey Rule of Evidence 8(1) provided: When the qualification of a person to be a witness, or the admissibility of evidence, or the existence of a privilege is stated in these rules to be subject to a condition, and the fulfillment of the condition is in issue, that issue is to be determined by the judge. In his determination the rules of evidence shall not apply except for Rule 4 or a valid claim of privilege. The judge shall indicate to the parties which one has the burden of producing evidence and the burden of proof on such issue as implied by the rule under which the question arises. The judge may

mined that the second expert, Dr. Wagoner, an epidemiologist, was not qualified to testify with regard to causation.²⁹ The court,

hear and determine such matters out of the presence or hearing of the jury. This rule shall not be construed to limit the right of a party to introduce before the jury evidence relevant to weight or credibility.

N.J. Evid. R. 8(1).

Rule 8(1) has been replaced by New Jersey Rule of Evidence 104, which provides:

(a) *Questions of admissibility generally.* When the qualification of a person to be a witness, or the admissibility of evidence, or the existence of a privilege is subject to a condition, and the fulfillment of the condition is in issue, that issue is to be determined by the judge. In making that determination the judge shall not apply the rules of evidence except for Rule 403 or a valid claim of privilege. The judge may hear and determine such matters out of the presence or hearing of the jury.

(b) *Relevance conditioned on fact.* Where evidence is otherwise admissible if relevant and its relevance is subject to a condition, the judge shall admit it upon or subject to the introduction of sufficient evidence to support a finding of the condition. In such cases the judge shall instruct the jury to consider the issue of the fulfillment of the condition and to disregard the evidence if it finds that the condition was not fulfilled. The jury shall be instructed to disregard the evidence if the judge subsequently determines that a jury could not reasonably find that the condition was fulfilled.

(c) *Preliminary hearings on admissibility of defendant's statements.* Where by virtue of any rule of law a judge is required in a criminal action to make a preliminary determination as to the admissibility of a statement by the defendant, the judge shall hear and determine the question of its admissibility out of the presence of the jury. In such a hearing the rules of evidence shall apply and the burden of persuasion as to the admissibility of the statement is on the prosecution. If the judge admits the statement the jury shall not be informed of the finding that the statement is admissible but shall be instructed to disregard the statement if it finds that it is not credible. If the judge subsequently determines from all of the evidence that the statement is not admissible, the judge shall take appropriate action.

(d) *Testimony by accused.* By testifying upon a preliminary matter, the accused does not become subject to cross-examination as to other issues in the case.

(e) *Weight and credibility.* This rule does not limit the right of a party to introduce before the jury evidence relevant to weight or credibility.

N.J.R.E. 104.

In deciding evidentiary matters, an alternative to the Rule 8 procedure is the *in limine* hearing. Cohen & Mindnich, *supra* note 4, at 1022 n.42. The Third Circuit asserted that "where there are numerous experts presenting voluminous testimony on the cutting edge of scientific research, an *in limine* hearing may be a very useful tool in conducting the inquiry, fact finding and balancing, which are the hallmarks of Rules 703 and 403 respectively." *In re Paoli Railroad Yard PCB Litigation*, 916 F.2d 829, 859 (3d Cir. 1990). Certain New Jersey courts, however, preferred the Rule 8 hearing to the *in limine* hearing. Cohen & Mindnich, *supra* note 4, at 1022 n.42 (citing *Rubanick v. Witco Chemical Corp.*, 242 N.J. Super. 36, 46, 576 A.2d 4, 9 (App. Div. 1990); *Belardini v. Krikorian*, 222 N.J. Super. 457, 464, 537 A. 2d 700, 704 (App. Div. 1988)).

²⁹ *Landrigan*, 127 N.J. at 411, 605 A.2d at 1082-83.

however, permitted Dr. Wagoner to proffer testimony relating to the methods of epidemiology and to generalized epidemiological findings linking asbestos to colon cancer.³⁰

At the conclusion of plaintiff's case, the defendants moved for a directed verdict.³¹ Upon considering the defendants' motion, the trial judge determined that the plaintiff had failed to meet the burden of proving causation.³² In the court's estimation, Dr. Sokolowski's testimony was a net opinion,³³ and Dr. Wagoner's limited testimony offered no proof of causation.³⁴ The trial court, therefore, granted the motion for directed verdict.³⁵

The appellate division affirmed the ruling of the lower court with regard to the admissibility and value of the expert testimony.³⁶

³⁰ *Id.*, 605 A.2d at 1083. The court allowed Dr. Wagoner to state his opinion "that asbestos causes colon cancer in humans." *Id.* The trial court, however, would not permit Dr. Wagoner to apply that opinion to Landrigan's factual scenario. *Id.*

³¹ *Id.* A motion for directed verdict is also referred to as a motion for judgment at trial. See N.J. Ct. R. 4:40-1. New Jersey Court Rule 4:40-1 provides:

A motion for judgment [at trial], stating specifically the grounds therefor, may be made by a party either at the close of all the evidence or at the close of the evidence offered by an opponent. If the motion is made prior to the close of all the evidence and is denied, the moving party may then offer evidence without having reserved the right to do so. A motion for judgment which is denied is not a waiver of trial by jury even if all parties to the action have so moved.

Id. A motion for judgment at trial must be denied if there exists any evidence or inference, taken in a light most favorable to the opponent of the motion, which supports the position that a jury could differ on the outcome of the motion. N.J. Ct. R. 4:40-1 cmt.; *Evers v. Dollinger*, 95 N.J. 399, 406, 471 A.2d 405, 409 (1984); *Bell v. Eastern Beef Co.*, 42 N.J. 126, 129, 199 A.2d 646, 647 (1964).

³² *Landrigan*, 127 N.J. at 411-12, 605 A.2d at 1083.

³³ A net opinion is "an expert's bare conclusions, unsupported by factual evidence" and is, therefore, inadmissible. *Buckelew v. Grossbard*, 87 N.J. 512, 524, 435 A.2d 1150, 1156 (1981).

³⁴ *Id.* at 411-12, 605 A.2d at 1083. With regard to Dr. Sokolowski's testimony, the trial judge explained: "Epidemiological evidence can only be used to show that a defendant's conduct increased a plaintiff's risk of injury to some measurable extent but it can not be used to answer the critical question did the asbestos cause Mr. Landrigan's colon cancer." *Id.*

On the issue of Dr. Wagoner's testimony, the trial judge stated:

Dr. Wagoner is not a medical doctor. He never prescribed a course of treatment for cancer patients. He conducted no human research. Dr. Wagoner teaches that if you can't find the cause of a disease by medical observation and you can find no other cause for it, you then go to these studies that have been conducted and pick a cause from a known risk or an increased risk factor.

Id. at 412, 605 A.2d at 1083.

³⁵ *Id.* at 411, 605 A.2d at 1083.

³⁶ *Landrigan v. Celotex Corp.*, 243 N.J. Super. 449, 464, 579 A.2d 1268, 1275 (App. Div. 1990), *rev'd*, 127 N.J. 404, 605 A.2d 1079 (1992). The appellate division elected not to address whether the trial court had properly directed the plaintiff to try her

Subsequently, the New Jersey Supreme Court granted certification to determine whether the epidemiological evidence was properly rejected by the lower courts.³⁷ The court concluded that the trial judge should have evaluated the soundness of Dr. Sokolowski's methodology before ruling upon the value of his testimony.³⁸ The court further determined that Dr. Wagoner's causation testimony should not have been barred simply because Wagoner was not a medical doctor.³⁹ Consequently, the supreme court reversed and remanded the matter to the trial court, holding that the testimony of both experts should be admitted provided that the experts had employed a reasonable methodology.⁴⁰

Case law evaluating the admissibility of scientific evidence has sought to answer two essential questions: (1) who should assess the

claims under the strict liability theory alone. *Id.* at 462, 579 A.2d at 1274. The appellate division stated: "Although we agree that the trial court erred in severing plaintiff's strict liability and negligence claims for trial, our disposition of this appeal would not be altered by the two claims having been tried together. The evidence of proximate cause would have been the same." *Id.*

³⁷ *Landrigan v. Celotex Corp.*, 127 N.J. 324, 604 A.2d 599 (1990).

³⁸ *Landrigan*, 127 N.J. at 420-21, 605 A.2d at 1088.

³⁹ *Id.* at 422, 605 A.2d at 1088-89. The final element of the court's holding pertained to the trial court's severance of the plaintiff's strict liability and negligence claims. *Id.* at 423-27, 605 A.2d at 1089-91. The court consented to review the trial court's ruling despite the fact that no order was entered. *Id.* at 424, 605 A.2d at 1089. Failure to enter an order, the court remarked, would ordinarily preclude an appeal. *Id.* (citing *Credit Bureau Collection Agency v. Lind*, 71 N.J. Super. 326, 328-29, 177 A.2d 36, 37 (App. Div. 1961); *Homeowner's Taxpayers Ass'n of S. Plainfield, Inc. v. Borough of S. Plainfield Sewerage Auth.*, 60 N.J. Super. 321, 323, 158 A.2d 847, 848 (App. Div. 1960)). Since the parties agreed on the context of the trial court's ruling, however, the justices found that the requirement of an order had been constructively met. *Id.* (citing N.J. Cr. R. 1:1-2; *Bitting v. Willett*, 47 N.J. 6, 9, 218 A.2d 859, 861 (1966)).

Justice Pollock began his analysis of this particular issue by noting that the effect of the trial court's action was to force the plaintiff to choose one theory over the other. *Id.*, 605 A.2d at 1090. To assess the propriety of this ruling, the justice reviewed the court's position on strict liability claims in asbestos cases. *Id.* at 425, 605 A.2d at 1090. Justice Pollock explained that the court had "limited the abolition of the state-of-the-art defense to asbestos cases." *Id.* at 426, 605 A.2d at 1090. A defendant's knowledge, the court stated, is not relevant to a claim for compensatory damages based upon a strict liability theory. *Id.* (citing *Fischer v. Johns-Manville Corp.*, 103 N.J. 643, 656, 512 A.2d 466, 473 (1986)). Justice Pollock stated that demands for punitive damages do, however, require proof of the defendant's knowledge. *Id.* (citing *Fischer*, 103 N.J. at 656, 512 A.2d at 473).

Moreover, Justice Pollock took under advisement the defendants' concern that jurors would be unable to separate the different levels of proof associated with the strict liability and negligence theories. *Id.* at 427, 605 A.2d at 1091. The justice, however, expressed the court's confidence that careful instructions and special verdicts would prevent jury confusion. *Id.* The court therefore held that on remand, the trial court should permit the plaintiff to proceed on both claims. *Id.*

⁴⁰ *Id.* at 417-18, 428, 605 A.2d at 1086, 1091.

admissibility of expert testimony; and (2) based upon what standard should that determination be made?⁴¹ In response to the first inquiry, courts have fashioned two antithetical approaches.⁴² A liberal approach to the problem was enunciated in *Ferebee v. Chevron Chemical Co.*⁴³ In *Ferebee*, the family of a deceased employee of a government agricultural research center attempted to establish a causal connection between the decedent's affliction with pulmonary fibrosis⁴⁴ and his long term occupational exposure to paraquat.⁴⁵ At trial, the plaintiff's and the defendant's experts arrived at contradictory conclusions, despite the fact that both had employed the same diagnostic methodology when formulating their respective opinions.⁴⁶ The jury adopted the testimony of the plain-

⁴¹ Cohen & Mindnich, *supra* note 4, at 1021.

⁴² *Id.* at 1022-24. One school believed that the jury should assess the reliability and validity of expert testimony. *Id.* at 1022. The second school, however, felt that these questions should be left to the court. *Id.* at 1024.

⁴³ 736 F.2d 1529 (D.C. Cir.), *cert. denied*, 469 U.S. 1062 (1984). See Cohen & Mindnich, *supra* note 4, at 1022 (referring to the *Ferebee* court's liberal approach).

⁴⁴ Pulmonary fibrosis is a condition characterized by "an excessive growth of fibrous connective tissue" inside the lungs. THE WORLD BOOK DICTIONARY 791, 1686 (Clarence L. Barnhart & Robert K. Barnhart eds., 1980).

The lungs, like all other organs, are composed of a framework of supporting tissue and a vital, functioning part through which the exchanges between the blood and the air take place. The fibrous tissue is in the framework, so that the overgrowth is at the expense of the functioning part. The fibrous tissue invades the functional tissue and replaces it.

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⁴⁵ *Ferebee*, 736 F.2d at 1531-32. Paraquat is a toxic agricultural herbicide marketed in America since 1966. *Id.* at 1532. Because dermal absorption of the herbicide can cause acute injury, its sale and labelling has been federally regulated from the time the product was first marketed in the United States. *Id.* Once the responsibility of the Department of Agriculture, the Environmental Protection Agency now oversees the packaging and distribution of paraquat. *Id.* Chevron is the sole distributor of paraquat in the United States. *Id.* The plaintiff, Richard Ferebee, was "an agricultural worker at the Beltsville Agricultural Research Center, an installation of the United States Department of Agriculture located in Beltsville, Maryland." *Id.* at 1531. Ferebee's first exposure to paraquat occurred during the outdoor growing season of 1977 and continued throughout 1978 and 1979. *Id.* at 1532. Ferebee sprayed the herbicide approximately six or seven times per month with each exposure lasting approximately one to three hours. *Id.* As a result, the dilute chemical mixture frequently came into contact with his skin. *Id.*

⁴⁶ *Id.* at 1535. At trial, the plaintiff presented the testimony of pulmonary specialist Dr. Muhammad Yusef and "Dr. Ronald G. Crystal, Chief of the Pulmonary Branch of the Heart, Lung and Blood Institute." *Id.* at 1532-33. Both doctors had previously examined, diagnosed and treated the plaintiff. *Id.* In addition, both doctors based their testimony upon their own observations, medical tests performed on the plaintiff and epidemiological studies that indicated a causal connection between dermal absorption of paraquat and the development of pulmonary fibrosis. *Id.* at 1533. The

tiff's experts and held the defendant, Chevron, strictly liable because it failed to warn of the effects of long-term exposure to paraquat.⁴⁷

On appeal, the District of Columbia Circuit Court of Appeals affirmed the lower court decision and held that in a typical battle of the experts the jury must determine the victor.⁴⁸ Reasoning that judges are no more qualified to analyze the evolving sciences of medicine and epidemiology than the lay members of a jury, the court eschewed any duty to rule on the reliability of the experts' opinions.⁴⁹ The D.C. Circuit's liberal reasoning has earned adherence in several jurisdictions,⁵⁰ including the Third Circuit.⁵¹

plaintiff died before the case reached trial and, as a result, defendant's experts never examined him. *Id.* at 1532, 1535.

⁴⁷ *Id.* at 1532.

⁴⁸ *Id.* at 1535 (citing *Jenkins v. United States*, 307 F.2d 637, 646 (D.C. Cir. 1962)). On appeal, Chevron argued, *inter alia*, that the jury's verdict was inconsistent with the weight of the evidence. *Id.* Chevron argued that paraquat is only acutely toxic, which means that any injury caused by the herbicide will manifest itself very quickly, usually within days or weeks, and that the injury will cease with the exposure. *Id.* Chevron contended that the plaintiff's symptoms of pulmonary fibrosis did not manifest themselves until ten months after his most recent contact with paraquat and that his condition continued to progress long after his final exposure to the herbicide in 1979. *Id.* Chevron maintained that there was no scientific evidence that paraquat causes any kind of chronic injury. *Id.*

⁴⁹ *Id.* at 1534. The *Ferebee* court declared:

Judges, both trial and appellate, have no special competence to resolve the complex and refractory causal issues raised by the attempt to link low-level exposure to toxic chemicals with human disease. On questions such as these, which stand at the frontier of current medical and epidemiological inquiry, if experts are willing to testify that such a link exists, it is for the jury to decide whether to credit such testimony.

Id. In other words, the court posited, if an expert is willing to espouse a particular scientific theory, the jury, not the judge, is properly charged with the task of weighing the verity and efficacy of his testimony. *See id.*

⁵⁰ *See, e.g., Wells v. Ortho Pharmaceutical Corp.*, 788 F.2d 741, 745, *cert. denied*, *Ortho Pharmaceutical Corp. v. Wells, et al.*, 479 U.S. 950 (1986) (stating that if the trier of fact is satisfied that medical evidence establishes legal causation to a reasonable degree of certainty, it does not matter whether the scientific community requires more research before resolving the question); *Lanzilotti v. Merrell Dow Pharmaceutical Inc.*, No. 82-0183, 1986 WL 7832, at *2 (E.D. Pa. July 10, 1986) (finding that when experts proffer opposing testimony, a jury must decide which theory is more credible).

⁵¹ *Cohen & Mindnich, supra* note 4, at 1023. *See In re Japanese Electronic Products*, 723 F.2d 238, 279 (3d Cir. 1983), *rev'd on other grounds sub nom. Matsushita Electric Industrial Co., Ltd. v. Zenith Radio Corp.*, 475 U.S. 574, 598 (1986) (stating that "the suggestion that the court must, in deciding on admissibility, carefully scrutinize the underlying assumptions, the inferences drawn, and the conclusions reached, if followed rigorously, would result in the trial court, as distinguished from the factfinder, deciding the weight to be given to the testimony"); *Knight v. Otis Elevator Co.*, 596 F.2d 84, 87-88 (3d Cir. 1979) (declaring that the trial court's failure to admit expert testimony usurped the jury's role as the fact finder).

The second, more restrictive approach to the admission of expert testimonial evidence was adopted by the United States District Court for the Eastern District of New York in *In re Agent Orange Product Liability Litigation*.⁵² This landmark case addressed the health problems suffered by many veterans who had been exposed to Agent Orange, a low-level dioxin, during the Vietnam War.⁵³ Alleging that the plaintiffs' epidemiological evidence failed to reach the requisite level of causation, the defendant chemical manufacturer moved for summary judgment.⁵⁴ In granting the motion, the

Several courts have pointed to *Japanese Electronic* as the prime example of the liberal approach to admitting expert testimony. See, e.g., *In re Agent Orange Product Liability Litigation*, 611 F. Supp. 1223, 1244 (E.D.N.Y. 1985), *aff'd*, 818 F.2d 187 (2d Cir. 1987), *cert. denied sub nom. Lombardi v. Dow Chemical Co.*, 487 U.S. 1234 (1988) (stating that the liberal view, espoused by *Japanese Electronic*, permits an expert to formulate his opinion based upon data reasonably relied upon by other members of his field without regard to the reliability of the data itself).

⁵² 611 F. Supp. 1223 (E.D.N.Y. 1985), *aff'd*, 818 F.2d 187 (2d Cir. 1987), *cert. denied sub nom. Lombardi v. Dow Chemical Co.*, 487 U.S. 1234 (1988). See Cohen & Mindnich, *supra* note 4, at 1024 (stating that the Eastern District of New York espoused the more restrictive view on the admissibility of evidence).

⁵³ *Agent Orange*, 611 F. Supp. at 1228. Vietnam veterans and their families filed claims against seven chemical companies, who manufactured and supplied Agent Orange to the United States government during the Vietnam War. *Id.* Pursuant to Federal Rule of Civil Procedure 23 (b)(3), the district court "certified a class action against the defendant chemical companies." *Id.* at 1229. The class included members of the American, New Zealand and Australian armed forces who, during the years 1961 to 1972, served in Vietnam and were injured as a result of exposure to Agent Orange or certain other phenoxy herbicides in the performance of their military duty. *Id.* The veterans' spouses, parents and children directly or indirectly injured as a consequence of the exposure were also included in the class. *Id.* Records indicate that approximately 600,000 service people suffered exposure to Agent Orange. *Id.* at 1230. The class was considerably larger, however, because it included the relatives of the exposed veterans. *Id.* Two hundred eighty-one veterans opted out of the class, filing the separate claims at issue in this action. *Id.* After reaching a settlement with the members of the class, the defendants moved for summary judgment regarding the separately filed claims. *Id.*

⁵⁴ *Id.* To establish causation, the plaintiffs relied upon epidemiological studies and the general affidavits of various doctors, two of which were accompanied by affidavits of the plaintiffs. *Id.* at 1231-39. The court held that the testimony of the two doctors was inadmissible because the doctors had relied upon the affidavits and checklists prepared by the veterans to formulate their opinions. *Id.* at 1246. The court explained that the affidavits and checklists were not admissible under Federal Rule of Evidence 703 because experts would not reasonably rely upon them. *Id.* The court further stated that it "takes judicial notice—based on hundreds of trials—that no reputable physician relies on hearsay checklists by litigants to reach a conclusion with respect to the cause of their afflictions." *Id.* (citations omitted).

For other cases addressing the issue of summary judgment and court control in toxic tort litigation where epidemiological evidence is relied upon, see *Fontenot v. Upjohn Co.*, 780 F.2d 1190, 1195-97 (5th Cir. 1986) (granting a motion for summary judgment where the plaintiff failed to produce evidence that progesterone, manufactured by the defendant, caused birth defects); *Marder v. G.D. Searle & Co.*, 630

court held that in situations where proof of causation rests almost entirely upon expert opinion, a stricter standard ought to be applied.⁵⁵ This strict standard, the court explained, requires the trial judge to carefully scrutinize the sources of proffered evidence before presentation to the jury.⁵⁶ Given the specialized nature of evidence in toxic tort litigation, the court suggested that toxic tort cases should always employ this stricter standard.⁵⁷

The New Jersey Supreme Court, however, has rejected the strict standard and has inclined toward the liberal approach.⁵⁸ In *Bowen v. Bowen*,⁵⁹ a divorce action, the supreme court faced the difficult task of placing a value on a minority stock interest in a close corporation.⁶⁰ The *Bowen* court approved the admission of

F.Supp. 1087, 1095 (D. Md. 1986), *aff'd without opinion sub nom.* Wheelahan v. G.D. Searle & Co., 814 F.2d 655 (4th Cir. 1987) (holding that epidemiological and non-epidemiological evidence did not establish causation in a case involving an intrauterine device); *Richardson v. Richardson-Merrell, Inc.*, 649 F. Supp. 799, 799-800 (D.D.C. 1986), *aff'd*, 857 F.2d 823, 833 (D.C. Cir. 1988), *cert. denied*, 110 S. Ct. 218 (1989) (granting judgment notwithstanding the verdict in a case alleging birth defects caused by Bendectin).

⁵⁵ *Agent Orange*, 611 F. Supp. at 1244.

⁵⁶ *Id.* The court opined that a trial judge should at least confirm that the expert founded "his or her opinion on sufficient factual data, [did] not rely on hearsay deemed unreliable by other experts in the field, and assert[ed] conclusions with sufficient certainty to be useful given applicable burdens of proof." *Id.*

⁵⁷ *Id.* at 1260. The court explained that "[t]he uncertainty of the evidence in such cases, dependent as it is upon speculative scientific hypotheses and epidemiological studies, creates a special need for robust screening of experts and gatekeeping under Rules 403 and 703 by the court." *Id.*

The approach espoused by the *Agent Orange* court has considerable support in other jurisdictions. *See, e.g.,* *Head v. Lithonia Corp.*, 881 F.2d 941, 944 (10th Cir. 1989) (stating that the trial court ought to conduct a preliminary examination of expert opinion testimony to discover whether the opinion and its factual foundations are reliable); *Richardson*, 649 F. Supp. at 829 (declaring that a court should, as a matter of law, determine whether an expert's testimony is sufficiently grounded in fact); *Viterbo v. Dow Chemical Co.*, 826 F.2d 420, 422 (5th Cir. 1987) (explaining that a trial judge is entitled to inquire as to the reliability and factual basis of an expert's opinion); *Lynch v. Merrell-National Lab.*, 646 F. Supp. 856, 864 (D. Mass. 1986), *aff'd*, 830 F.2d 1190 (1st Cir. 1987) (noting that courts must question whether comparable experts in the witness's field would rely on the same data and whether that reliance is reasonable); *Marder*, 630 F. Supp. at 1089 (citations omitted) (observing that the purpose of the trial court's inquiry is to make certain that an expert's testimony is not without factual support).

⁵⁸ *Cohen & Mindnich*, *supra* note 4, at 1023.

⁵⁹ 96 N.J. 36, 473 A.2d 73 (1984).

⁶⁰ *Id.* at 40, 473 A.2d at 75. The parties in *Bowen* married in 1955 and were the parents of four children. *Id.* Early in the marriage, Mrs. Bowen worked to help finance her husband's engineering education. *Id.* Mr. Bowen left his employment at Union Carbide in 1971 to accept a position at a small manufacturing firm. *Id.* Two years later, Mr. Bowen formed the Polycel Corporation with two other employees of the manufacturing firm. *Id.* At the time of the divorce, Mr. Bowen was a twenty-two

an accountant's testimony even though the witness could offer no proof that his conclusion was based upon generally accepted accounting principles.⁶¹ The court held that the unreliability of the testimony pertains only to weight and credibility, not admissibility.⁶² According to the *Bowen* ruling, the judge must decide the admissibility of the testimony, and the jury must determine the proper weight to which the testimony is entitled.⁶³ Therefore, the question of unreliability is properly left to the jury.⁶⁴

Six years later, the New Jersey Supreme Court cited the *Bowen* decision with approval in *Ryan v. KDI Sylvan Pools, Inc.*⁶⁵ In *Ryan*, the court reiterated its position that the jury, not the judge, should decide how much weight to accord the testimony of a given ex-

percent shareholder in Polycel. *Id.* The lower court ordered that all marital property be divided equally between Mr. and Mrs. Bowen based on the length of the marriage. *Id.* In so doing, the trial court arrived at what it considered to be "an entirely new and more practical scheme of distribution." *Id.* (citing the unreported trial court decision). The trial court ordered that the husband retain legal title to all the stock while awarding the wife an equitable title to one-half of the stock. *Id.* at 40-41, 473 A.2d at 75. The appellate division affirmed. *Id.* at 41, 473 A.2d at 75. The supreme court, however, reversed and remanded, directing the trial court to arrive at a value for the stock. *Id.* at 53, 473 A.2d at 82.

⁶¹ *Id.* at 49, 53, 473 A.2d at 80, 82.

⁶² *Id.* at 49, 473 A.2d at 80.

⁶³ *Ryan v. KDI Sylvan Pools, Inc.*, 121 N.J. 276, 284, 579 A.2d 1241, 1245 (1990). Because the *Bowen* court's analysis of evidentiary standards was not the primary focus of the opinion, its significance as evidentiary precedent was negligible until its treatment in *Ryan*. *See id.* The *Ryan* ruling gave the impression that the *Bowen* court engaged in a lengthy explanation of New Jersey's position on the admission of expert testimony. *See id.* In actuality, the *Ryan* court seized upon a single sentence in the very last paragraph of the *Bowen* opinion and formulated a doctrine by implication. *Id.* (citing *Bowen*, 96 N.J. at 53, 473 A.2d at 82) ("[O]pinions of value not based upon evidence in the record or of proven acceptance in the field should be given little weight.")). *See* Brian Simon, *The Basis of Expert Testimony: Ryan v. KDI Sylvan Pools Lets the Experts Have Their Way*, 43 RUTGERS L. REV. 1235, 1242 n.54 (1991) (suggesting that the *Ryan* court embraced the wrong statement of the *Bowen* holding).

⁶⁴ *Ryan*, 121 N.J. at 284, 579 A.2d at 1245.

⁶⁵ *Id.* In *Ryan*, the plaintiff was injured after diving into a residential swimming pool. *Id.* at 279, 579 A.2d at 1242. Plaintiff brought suit against the pool manufacturer alleging defective design and failure to provide adequate warning. *Id.* at 278, 579 A.2d at 1242. At trial, the defendant presented the testimony of Joseph Schmerler, an expert on the standards of the swimming pool industry. *Id.* at 281, 579 A.2d at 1243. The witness testified that the defendant had constructed the pool according to industry standards and that no posted warnings were needed at residential pools. *Id.* The trial court refused to admit Schmerler's testimony because the judge could not identify its factual foundation and, therefore, could not assess the reasonableness of the expert's reliance. *Id.* at 282, 579 A.2d at 1244. Subsequently, the appellate division affirmed, and the supreme court reversed and remanded. *Id.* at 283, 289, 579 A.2d at 1244, 1248. *See generally* Simon, *supra* note 63 (discussing *Ryan's* place in New Jersey's evidentiary scheme).

pert.⁶⁶ The *Ryan* holding also placed limitations upon the trial judge's role in determining admissibility.⁶⁷ Specifically, the court stated that the relevant judicial inquiry should be confined to whether other experts in the witness's field would rely upon the same facts in drawing their conclusions.⁶⁸ If such reliance is identified, the court continued, a presumption of reasonableness arises and the testimony may be presented to the jury.⁶⁹ The *Ryan* court posited that an automatic presumption of reliability, without some measure of judicial inquiry, would run counter to Federal Rule of Evidence 703⁷⁰ and its counterpart, New Jersey Rule of Evidence 56(2).⁷¹ According to the *Ryan* holding, judges have the duty to

⁶⁶ *Ryan*, 121 N.J. at 284, 579 A.2d at 1245.

⁶⁷ *Id.* at 289, 579 A.2d at 1247-48.

⁶⁸ *Id.*, 579 A.2d at 1248. The court may consider only whether other experts rely on the data. *Id.* The judge cannot substitute his judgment on the reasonableness of that reliance. *Id.*

⁶⁹ *Id.*, 579 A.2d at 1247.

⁷⁰ Federal Rule of Evidence 703 provides:

The facts or data in the particular case upon which an expert bases an opinion or inference may be those perceived by or made known to the expert at or before the hearing. If of a type reasonably relied upon by experts in the particular field in forming opinions or inferences upon the subject, the facts or data need not be admissible in evidence.

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⁷¹ *Ryan*, 121 N.J. at 288, 579 A.2d at 1247 (citation omitted). At the time *Landri-gan* was decided, New Jersey Rule of Evidence 56(2) provided:

A witness qualified pursuant to Rule 19 as an expert by knowledge, skill, experience, training or education may testify in the form of opinion or otherwise as to matters requiring scientific, technical or other specialized knowledge if such testimony will assist the trier of fact to understand the evidence or determine a fact in issue. The facts or data in the particular case upon which an expert bases an opinion or inference may be those perceived by or made known to him at or before the hearing. If of a type reasonably relied upon by experts in the particular field in forming opinions or inferences upon the subject, the facts or data need not be admissible in evidence.

N.J. Evid. R. 56(2).

Rule 56(2) has been replaced by New Jersey Rules of Evidence 702 and 703. See COMMITTEE REPORT, *supra* note 24, at 29. Rule 702 states:

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.

N.J.R.E. 702. Rule 703 provides:

The facts or data in the particular case upon which an expert bases an opinion or inference may be those perceived by or made known to the expert at or before the hearing. If of a type reasonably relied upon by experts in the particular field in forming opinions or inferences upon the subject, the facts or data need not be admissible in evidence.

N.J.R.E. 703.

determine whether an expert's reliance on data is reasonable.⁷² Thus, the *Ryan* court's formulation represents a compromise by limiting trial judges to a minimal level of review while still maintaining a measure of judicial scrutiny.⁷³

The second major question plaguing courts with regard to toxic tort litigation is the standard used to determine the admissibility of an expert's testimony.⁷⁴ The best known theory of admissibility dates back nearly seventy years to the "general acceptance" standard articulated in *Frye v. United States*.⁷⁵ In *Frye*, the seminal case on the admission of expert testimony,⁷⁶ the court considered the admissibility of a systolic blood pressure deception test, which in 1923 represented a relatively new scientific method.⁷⁷ Recogniz-

⁷² *Ryan*, 121 N.J. at 289, 579 A.2d at 1247. One commentator proposed that the *Ryan* holding "creates a risk that untrustworthy testimony will get to the jury." Simon, *supra* note 63, at 1253.

⁷³ *Ryan*, 121 N.J. at 289, 579 A.2d at 1247-48. The *Ryan* court held:

We interpret Evidence Rule 56(2) to require that a court make inquiry into and a finding on whether experts in the given field rely on certain information. If such reliance be found, then it is presumed to be reasonable. That interpretation of the Rule strikes a fair balance between the intent of the amended language and the "spirit" of the prior Rule, which has been interpreted to require the court to make a determination on the reliability of the testimony. The amendment was made explicitly to expand the data on which an expert can rely in forming an opinion. The focus should be on what the experts in fact rely on, not on whether the court thinks they should so rely. Requiring the trial court to make a finding on whether experts in the field actually rely on certain information satisfies the intent of the new language. Allowing the court to overrule that presumption of reliability will result in the exclusion of evidence only under unusual or extreme circumstances, thus satisfying the "spirit" of the former Rule.

Id.

⁷⁴ See Cohen & Mindnich, *supra* note 4, at 1025-34.

⁷⁵ 293 F. 1013 (D.C. Cir. 1923); see Cohen & Mindnich, *supra* note 4, at 1027. For a more comprehensive treatment of the *Frye* holding, see Melissa M. Horne, Note, *Novel Scientific Evidence: Does Frye Require That General Acceptance Within the Scientific Community be Established by Disinterested Scientists?*, 65 U. DET. L. REV. 147 (1987); Paul C. Giannelli, *The Admissibility of Novel Scientific Evidence: Frye v. United States, a Half-Century Later*, 80 COLUM. L. REV. 1197 (1980); Andre A. Moenssens, *Admissibility Of Scientific Evidence—An Alternative To The Frye Rule*, 25 WM. & MARY L. REV. 545 (1983-84).

⁷⁶ See *State v. Cavallo*, 88 N.J. 508, 517, 443 A.2d 1020, 1024 (1982); Cohen & Mindnich, *supra* note 4, at 1027. It is a piece of judicial irony that this landmark opinion, which forms the foundation of American evidentiary law and has been the subject of considerable legal commentary, is only two pages long and cites no case law in support of its conclusion. See *Frye*, 293 F. at 1013-14.

⁷⁷ *Id.* at 1013. In *Frye*, the defendant was convicted of second degree murder. *Id.* At trial, his attorney sought to introduce into evidence the results of a systolic blood pressure deception test. *Id.* The theory behind the test, which is a forerunner of the polygraph test, is that "truth is spontaneous, and comes without conscious effort, while the utterance of a falsehood requires a conscious effort, which is reflected in the

ing that judges are often ill-equipped to assess the reliability of expert testimony, the *Frye* test requires an expert to rest his conclusions upon principles which have achieved general acceptance within the scientific community.⁷⁸ Once the proponent of the testimony has met the burden of proving that the evidence has attained general acceptance, the judicial inquiry ends and the testimony may be entered on the record.⁷⁹

Although the *Frye* holding remained a legal fixture in many jurisdictions,⁸⁰ several courts, including the United States Supreme Court, have recently rejected the general acceptance standard primarily because of the promulgation of the Federal Rules of Evidence.⁸¹ While the Federal Rules of Evidence do not adopt a

blood pressure." *Id.* at 1014. The trial court, in accordance with the government's objections, would not allow testimony from the scientist who conducted the defendant's test. *Id.* The court also refused to have the test performed in the courtroom before the jury. *Id.* In upholding the decision of the lower court, the D.C. Circuit held that the systolic blood pressure test had "not yet gained such standing and scientific recognition among physiological and psychological authorities as would justify the courts in admitting expert testimony deduced from the discovery, development, and experiments thus far made." *Id.*

⁷⁸ *Id.* Specifically, the D.C. Circuit Court of Appeals stated:

Just when a scientific principle or discovery crosses the line between the experimental and demonstrable stages is difficult to define. Somewhere in this twilight zone the evidential force of the principle must be recognized, and while the courts will go a long way in admitting expert testimony deduced from a well-recognized scientific principle or discovery, *the thing from which the deduction is made must be sufficiently established to have gained general acceptance in the particular field in which it belongs.*

Id. (emphasis added). If the basis of the testimony has not reached this level of development, the *Frye* court explained, the trial judge may not admit it into evidence. *Id.*

⁷⁹ *See id.*

⁸⁰ *See* Edward J. Imwinkelried, *Judge Versus Jury: Who Should Decide Questions Of Preliminary Facts Conditioning The Admissibility of Scientific Evidence*, 25 WM. & MARY L. REV. 577, 577 (1984) (stating that approximately forty-five jurisdictions had adopted the *Frye* general acceptance standard by the late 70's). *See infra* note 159 (discussing the United States Supreme Court's rejection of *Frye* in the case *Daubert v. Merrell Dow Pharmaceuticals*).

⁸¹ Imwinkelried, *supra* note 80, at 578 (stating that, as of 1984, fifteen states and two federal circuits had rejected the *Frye* rule). *See, e.g.,* *United States v. Williams*, 583 F.2d 1194, 1198 (2d Cir. 1978) (positing that judicial inquiry into the admissibility of scientific evidence must evidence conventional considerations, such as reliability, probativeness, and materiality against the likelihood of prejudice or confusion of the jury); *United States v. Baller*, 519 F.2d 463, 466 (4th Cir.), *cert. denied*, 423 U.S. 1019 (1975) (suggesting that relevant scientific evidence which is not prejudicial should be admitted and that its credibility is an issue for cross-examination); *United States v. Downing*, 753 F.2d 1224, 1237 (3d Cir. 1985) (rejecting the general acceptance standard and articulating a more flexible three-step analysis that involves assessing the reliability of testimony, the scientific technique, balancing the helpfulness of evidence with any confusion the technique might cause the jury and determining the relevancy

specific theory of admissibility, Federal Rule of Evidence 702⁸² seems to run contrary to the rigid general acceptance standard.⁸³ Particularly, Rule 702 calls for the admission of expert testimony whenever it would be helpful to the trier of fact.⁸⁴ Recent jurisprudence has begun to recognize that evidence which fails to meet the standard of general acceptance may nevertheless assist a jury in making its final determination.⁸⁵ Consequently, several courts have enunciated their own method of assessing the reliability of opinion testimony.⁸⁶

Whereas Rule 702 governs the admission of expert testimony in the federal courts, Rule of Evidence 56(2) governs the admission of expert testimony in the New Jersey court system.⁸⁷ The original text of Rule 56(2) stood for the proposition that expert

of the evidence to the issue at bar). See *infra* note 159 (discussing the United States Supreme Court's rejection of *Frye* in the case *Daubert v. Merrell Dow Pharmaceuticals*).

One commentator noted that numerous ambiguities exist as to the appropriate application of the general acceptance standard. Giannelli, *supra* note 75, at 1208. Giannelli listed the following unanswered questions: who must accept the procedure, what must be accepted, and by what method. *Id.* As a result, Giannelli stated, courts have found it necessary to establish the parameters of the general acceptance standard more narrowly than the *Frye* court. *Id.*

⁸² Specifically, Federal Rule of Evidence 702 provides: "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." FED. R. EVID. 702.

⁸³ See Cohen & Mindnich, *supra* note 4, at 1028. See *infra* note 159 (discussing the United States Supreme Court's rejection of *Frye* in the case *Daubert v. Merrell Dow Pharmaceuticals*).

⁸⁴ FED. R. EVID. 702. See *supra* note 82 (providing the text of Rule 702).

⁸⁵ See Cohen & Mindnich, *supra* note 4, at 1028-30 (citing *Downing*, 753 F.2d 1224 (3d Cir. 1975)). See *infra* note 159 (discussing the United States Supreme Court's rejection of *Frye* in the case *Daubert v. Merrell Dow Pharmaceuticals*).

⁸⁶ *Id.* at 1028. See *supra* note 81 (discussing the methods of assessing reliability utilized by other courts) and *infra* note 159 (discussing the United States Supreme Court's rejection of *Frye* in the case *Daubert v. Merrell Dow Pharmaceuticals*).

⁸⁷ N.J. Evid. R. 56(2). See *supra* note 71 (providing the text of Rule 56(2) and its newly enacted counterparts, Rules 702 and 703). The initial version of the rule was adopted in 1967. N.J. Evid. R. 56(2) (1967). The initiative to codify the New Jersey Rules of Evidence began in 1955 with the report of the Jacobs Committee. RICHARD J. BIUNNO, NEW JERSEY RULES OF EVIDENCE, preface by the Commission (Gann 1992 ed.). The effort continued in 1956 under the aegis of the Bigelow Commission. *Id.* The Evidence Act of 1960 adopted Rule 1(1) through 1(13), Rule 2 and Rules 23 through 40. *Id.* The Act also established a system for the adoption of future rules. *Id.* This mechanism allowed the supreme court to propose rules to the Legislature. *Id.* Rule 56(2) was among the final set of rules proposed by the court in 1964 and adopted by the Legislature in 1967. *Id.* The original version of the rule stated:

If the witness is testifying as an expert, testimony of the witness in the form of opinions or inferences is limited to such opinions as the judge finds are (a) based primarily on facts, data or other expert opinion es-

testimony, and the scientific principles which support it, must be reasonably reliable.⁸⁸ Although the reasonable reliability standard did not appear in the plain language of the rule, its presence was implied in section (b).⁸⁹ Specifically, testimony cannot be within an expert's special knowledge or skill if the field from which the expert derives such knowledge and skill has not been deemed reliable by the courts.⁹⁰

This requirement of reasonable reliability, long a part of New Jersey's common law of evidence, predated New Jersey's adoption of Rule 56(2).⁹¹ Indeed, the New Jersey courts defined reasonable reliability according to the general acceptance doctrine enunciated in *Frye*.⁹² In the 1967 *State v. Hurd* decision,⁹³ however, the New

tablished by evidence at the trial and (b) within the scope of the special knowledge, skill, experience or training possessed by the witness.

N.J. Evid. R. 56(2) (1967).

⁸⁸ Simon, *supra* note 63, at 1240. For cases delineating New Jersey's viewpoint on reasonable reliability, see *State v. Kelly*, 97 N.J. 178, 209, 478 A.2d 364, 379-80 (1984); *Bowen v. Bowen*, 96 N.J. 36, 49, 473 A.2d 73, 79-80 (1984); *State v. Cavallo*, 88 N.J. 508, 519-20, 443 A.2d 1020, 1025-26 (1982); *State v. Hurd*, 86 N.J. 525, 536, 432 A.2d 86, 91 (1981); *State v. Carey*, 49 N.J. 343, 352, 230 A.2d 384, 389 (1967).

⁸⁹ *Cavallo*, 88 N.J. at 516, 443 A.2d at 1024. See *supra* note 87 for the text of the original rule.

⁹⁰ *Cavallo*, 88 N.J. at 517 n.2, 443 A.2d at 1024 n.2.

⁹¹ *Id.*

⁹² Cohen & Mindnich, *supra* note 4, at 1031. In *State v. Kelly*, the New Jersey Supreme Court explained:

To meet the requirement that the expert's testimony be sufficiently reliable, defense counsel must show that the testimony satisfies New Jersey's standard of acceptability for scientific evidence. The technique or mode of analysis used by the expert must have a sufficient scientific basis to produce uniform and reasonably reliable results so as to contribute materially to the ascertainment of the truth.

Kelly, 97 N.J. at 209-10, 478 A.2d at 380 (citations omitted).

⁹³ 86 N.J. 525, 432 A.2d 86 (1981). Paul Hurd was accused of attempting to murder his former wife, Jane Sell. *Id.* at 530, 432 A.2d at 89. Hurd and Sell had had a particularly contentious relationship since their divorce in 1971, disagreeing over the disposition of jointly held property and visitation rights. *Id.* The most recent altercation took place by telephone between Hurd and David Sell, second husband of Jane, on the night of the assault. *Id.* Later in the evening, David Sell, who had been sleeping in the living room, was awakened by the sound of his wife's screams. *Id.* Rushing to the bedroom, David Sell met his wife, who claimed to have been stabbed by an unidentified attacker who had entered through the bedroom window. *Id.* After the attack, Mrs. Sell was unable to identify her assailant but referred the police to her ex-husband. *Id.* From that time on, the police investigation focused on Hurd and David Sell as the two primary suspects. *Id.* Because of Mrs. Sell's continuing inability to recall her attacker, the prosecutor's office recommended that she consult a psychiatrist in order to refresh her recollection through hypnosis. *Id.* While in a trance, Mrs. Sell identified Hurd as her assailant. *Id.* at 531, 432 A.2d at 89. Although she had expressed some initial mistrust of her identification, she nonetheless signed a statement, at the urging of the police department, which labelled Hurd as her attacker.

Jersey Supreme Court articulated a slightly reformulated standard.⁹⁴ The *Hurd* court held that hypnotically refreshed testimony is not admissible absent specified procedures to ensure its reliability.⁹⁵ Adding to the *Frye* test, the court proclaimed that expert testimony could be admitted only if it had sufficient factual basis to produce reasonably reliable, homogenous results that would materially contribute to the ascertainment of the truth.⁹⁶ With this modification, the court demonstrated a belief that reasonable reliability is a case-specific determination.⁹⁷

The *Hurd* test incorporated into the general acceptance standard an interest in protecting litigants from unreliable testimony that unfairly prejudices their cases.⁹⁸ Moreover, the additional re-

Id. at 531-32, 432 A.2d at 89. Based upon that statement, *Hurd* was arrested and indicted. *Id.* at 532, 432 A.2d at 89. After a lengthy hearing, the trial court refused to admit Mrs. Sell's identification of *Hurd*, not because it found hypnotically refreshed testimony to be *per se* inadmissible but because the State could not prove that it had complied with enumerated procedural safeguards. *Id.* at 532-33, 432 A.2d at 89-90. The appellate division denied the State's motion for leave to appeal the decision of the trial court. *Id.* at 533, 432 A.2d at 90. The New Jersey Supreme Court affirmed the appellate division's denial of the motion for leave to appeal. *Id.* at 533-34, 432 A.2d at 90.

⁹⁴ *Id.* at 536, 432 A.2d at 91. The *Hurd* court stated that this standard had previously been restricted to physical test results. *Id.* (citations omitted). In this case, the court believed "that the policy reasons embodied in the general acceptance standard are germane to hypnotically refreshed testimony as well." *Id.*

⁹⁵ *Id.* at 536-37, 432 A.2d at 91-92.

⁹⁶ *Id.* at 536, 432 A.2d at 91 (quoting *State v. Cary*, 49 N.J. 343, 352, 230 A.2d 384, 389 (1967)). See also *State v. Cavallo*, 88 N.J. 508, 520-21, 443 A.2d 1020, 1026 (1982) (stating that the *Hurd* holding is an addendum to the *Frye* test).

⁹⁷ *Id.* at 520, 443 A.2d at 1026. The *Cavallo* court stated "[e]xpert evidence that poses too great a danger of prejudice in some situations, and for some purposes, may be admissible in other circumstances where it will be more helpful and less prejudicial." *Id.*

⁹⁸ See *id.* When expert testimony is more likely to confuse than assist the trier of fact, however, a trial judge is entitled to deny admission of the testimony. N.J. Evid. R. 4. At the time *Landrigan* was decided, New Jersey Rule of Evidence 4 provided:

The judge may in his discretion exclude evidence if he finds that its probative value is substantially outweighed by the risk that its admission will either (a) necessitate undue consumption of time or (b) create substantial danger of undue prejudice or of confusing the issues or of misleading the jury.

Id. (emphasis added).

Rule 4 has been replaced by New Jersey Rule of Evidence 403, which provides: Except as otherwise provided by these rules or other law, relevant evidence may be excluded if its probative value is substantially outweighed by the risk of (a) undue prejudice, confusion of issues, or misleading the jury or (b) undue delay, waste of time, or needless presentation of cumulative evidence.

N.J.R.E. 403. See also *Butler v. Acme Markets, Inc.*, 89 N.J. 270, 283, 445 A.2d 1141, 1147 (1982) (stating that expert testimony is necessary where "the matter to be dealt

quirement that expert evidence assist the trier of fact signalled the beginning of New Jersey's rejection of the general acceptance standard and sparked the attendant realization that evidence which fails to meet the general acceptance requirement may nonetheless help to inform a jury's decision.⁹⁹

The *Hurd* formulation foreshadowed the amended version of New Jersey Rule of Evidence 56(2), which took effect on July 1, 1982.¹⁰⁰ The language, borrowed from Federal Rule of Evidence 702,¹⁰¹ gave effect to the *Hurd* ruling by incorporating the requirement that expert testimony assist the trier of fact.¹⁰² The amended rule further liberalized the standard for the admission of expert testimony by approving its admissibility based upon facts not adduced at trial.¹⁰³ Moreover, under the new rule, the facts upon which testimony is based need not even be admissible.¹⁰⁴

After the amendment of Rule 56(2), the New Jersey Supreme Court decided the landmark case, *State v. Kelly*.¹⁰⁵ In *Kelly*, the

with is so esoteric that jurors of common judgment and experience cannot form a valid judgment as to whether the conduct of the party was reasonable") (citations omitted). The primary purpose of expert testimony has always been to help jurors understand and decide complex issues. Cohen & Mindnich, *supra* note 4, at 1011-12.

⁹⁹ See *infra* notes 107-126 and accompanying text (discussing New Jersey's gradual rejection of the general acceptance standard).

¹⁰⁰ N.J. Evid. R. 56(2) (requiring expert testimony to assist the trier of fact). For the text of former New Jersey Rule of Evidence 56(2), see *supra* note 71.

¹⁰¹ FED. R. EVID. 702. The language of Federal Rule of Evidence 702 is essentially identical to that of New Jersey Evidence Rule 56(2). Compare FED. R. EVID. 702 with N.J. Evid. R. 56(2). For the provisions of Federal Rule of Evidence 702, see *supra* note 82.

¹⁰² N.J. Evid. R. 56(2). The motive behind the change was to "allow more latitude in the admission of expert opinion testimony' without being inconsistent with the 'spirit' of the old rule." N.J. Evid. R. 56(2) cmt. 7 (citing Ryan v. KDI Sylvan Pools, Inc., 121 N.J. 276, 284, 579 A.2d 1241, 1245 (1990); Rubanik v. Witco Chemical Corp., 242 N.J. Super. 36, 50, 576 A.2d 4, 11 (1990)).

¹⁰³ N.J. Evid. R. 56(2). In this regard the amended rule marks a change from the original version passed in 1967. See *supra* note 87 (setting forth the text of the original rule). The plain language of section (a) of the old rule explicitly stated that opinion testimony must rest on factual evidence already entered on the record. N.J. Evid. R. 56(2). Some courts were rather lenient in their enforcement of this provision. Simon, *supra* note 63, at 1239-40. Despite the flexible approach employed by some, all courts obeyed a minimum admissibility standard. *Id.* at 1240. According to this standard, no expert could present to a jury a conclusion which completely lacked factual foundation. *Id.* Such a conclusion is a net opinion. *Id.* See *supra* note 33 (discussing the net opinion rule).

¹⁰⁴ N.J. Evid. R. 56(2).

¹⁰⁵ 97 N.J. 178, 478 A.2d 364 (1984). The New Jersey Supreme Court's opinion in *Kelly* has been recognized as a landmark decision throughout the country. Lawrence S. Lustberg & John V. Jacobi, *The Battered Woman As Reasonable Person: A Critique Of The Appellate Division Decision In State v. McClain*, 22 SETON HALL L. REV. 365, 369 n.23 (1992) (citing *State v. Koss*, 551 N.E.2d 970, 973-74 (Ohio 1990) (citing *Kelly* to sup-

court assessed whether testimony on battered woman's syndrome met the standard for the admission of scientific evidence imposed by Rule 56(2).¹⁰⁶ The defendant in *Kelly*, a wife accused of murdering her husband, claimed that she had acted in self-defense.¹⁰⁷ Defense counsel attempted to support this claim with evidence on battered woman's syndrome, a relatively novel scientific theory.¹⁰⁸ Ultimately, the supreme court reversed and remanded the case for a new trial because the trial court failed to admit testimony on battered woman's syndrome.¹⁰⁹

The *Kelly* court commenced its analysis by outlining the three basic requirements of Rule 56(2).¹¹⁰ First, the court articulated, testimony must pertain to a topic that is beyond the understanding

port the proposition that battered woman's syndrome is not within a juror's common knowledge and, therefore, requires expert testimony); *State v. Hennum*, 441 N.W.2d 793, 798 n.2 (Minn. 1989) (citing *Kelly* as one of the many cases holding that testimony on battered woman's syndrome is admissible); *People v. Aris*, 264 Cal. Rptr. 167, 180 n.5 (Cal. Ct. App. 1989) (citing *Kelly* to support the admission of expert testimony on battered woman's syndrome); *State v. Norman*, 366 S.E.2d 586, 591 (N.C. Ct. App. 1988) (citing *Kelly* in support of the proposition that battered women are frequently so immobilized by fear of their abusive spouse that they cannot act in their own defense); *Commonwealth v. McNeely*, 534 A.2d 778, 780 (Pa. Super. Ct. 1987) (noting that *Kelly* held expert testimony on battered woman's syndrome to be admissible evidence of self-defense); *State v. Hodges*, 716 P.2d 563, 567 (Kan. 1986) (noting the *Kelly* court's belief that testimony on battered woman's syndrome is beyond the comprehension of the average juror); *State v. Hill*, 339 S.E.2d 121, 122 (S.C. 1986) (adopting *Kelly*'s definition of battered woman's syndrome); *People v. Torres*, 488 N.Y.S.2d 358, 360 (N.Y. Sup. Ct. 1985) (listing *Kelly* among the cases favoring the admissibility of expert testimony on battered woman's syndrome); *State v. Moore*, 695 P.2d 985, 989-90 (Or. Ct. App. 1985) (Newman, J., concurring) (extensively quoting the *Kelly* discussion on the characteristics of battered woman's syndrome).

¹⁰⁶ *Kelly*, 97 N.J. at 187, 208, 478 A.2d at 368, 379.

¹⁰⁷ *Id.* at 187-88, 478 A.2d at 368. The "defendant, Gladys Kelly, stabbed her husband, Ernest, with a pair of scissors." *Id.* at 187, 478 A.2d 368. Ernest died as a result of the injuries he sustained. *Id.* At trial, the defense claimed that Gladys had acted in self-defense. *Id.* at 188, 478 A.2d at 368. Apparently, over the course of their seven year marriage, Ernest had repeatedly beat Gladys. *Id.* at 187-88, 478 A.2d at 368. The defendant contended that Ernest had assaulted her on the afternoon of the stabbing. *Id.* Gladys stated that she feared that if she did not defend herself, her husband would kill her. *Id.*

¹⁰⁸ *Id.* To establish the appropriate mens rea for the self-defense claim, the defense presented the testimony of Dr. Lois Veronen—an expert on battered woman's syndrome. *Id.* See Lustberg & Jacobi, *supra* note 105 (criticizing the *McClain* court's interpretation of *Kelly*).

¹⁰⁹ *Kelly*, 97 N.J. at 212-14, 478 A.2d at 381-82. The *Kelly* court felt that the defendant's witness qualified as an expert on battered woman's syndrome. *Id.* at 212, 478 A.2d at 381. The court also believed that the theories upon which the testimony was based had achieved sufficient reliability in the scientific community. *Id.* Because the trial court never addressed the issue of reliability, finding instead that the witness was not qualified, the court remanded for a new trial. *Id.*

¹¹⁰ *Id.* at 208, 478 A.2d at 379.

of the average juror.¹¹¹ The second requirement, the court declared, is that the proffered testimony must be reliable and from a sufficiently developed scientific area.¹¹² Finally, the court explained, the witness must be qualified to offer such testimony.¹¹³ Battered woman's syndrome, the court proposed, met all three of these requirements.¹¹⁴ Although the *Kelly* court made no express attempt to overturn the general acceptance standard, the court's willingness to admit a relatively new scientific theory established a movement toward liberalization of the admissibility standard.¹¹⁵

The New Jersey Supreme Court made its greatest stride toward liberalizing the standard for admission of new scientific theories in *Rubanick v. Witco Chemical Corp.*¹¹⁶ The *Rubanick* court considered whether a biochemist was qualified to testify that PCB¹¹⁷ exposure could cause colon cancer.¹¹⁸ The biochemist's status as a "nonphysician," the court ruled, did not preclude him from testifying as to the cause of the plaintiff's cancer.¹¹⁹ More significantly, however, the *Rubanick* court asserted that general acceptance was not the

¹¹¹ *Id.*

¹¹² *Id.* Specifically, the court explained:

In effect, this Rule imposes three basic requirements for the admission of expert testimony: (1) the intended testimony must concern a subject matter that is beyond the ken of the average juror; (2) the field testified to must be at a state of the art such that an expert's testimony could be sufficiently reliable; and (3) the witness must have sufficient expertise to offer the intended testimony.

Id. (citations omitted).

¹¹³ *Id.*

¹¹⁴ *Id.* at 210-12, 478 A.2d at 380-81. In particular, the court stated that the "subject is beyond the ken of the average juror and thus is suitable for explanation through expert testimony." *Id.* at 209 n.15, 478 A.2d at 379 n.15 (citing *Ibn-Tamas v. United States*, 407 A.2d 626, 635 (D.C. 1979); *Hawthorne v. State*, 408 So. 2d 801, 806, *reh'g denied*, 415 So. 2d 1361 (Fla. Dist. Ct. App. 1982); *Smith v. State*, 277 S.E.2d 678, 683 (Ga. 1981); *State v. Anaya*, 438 A.2d 892, 894 (Me. 1981)). The court, however, remanded the matter to the trial court in order to give the State an opportunity to cross examine the witness and challenge the finding that battered woman's syndrome represents a reasonably reliable scientific theory. *Id.* at 212-13, 478 A.2d at 381.

¹¹⁵ *Id.* at 212, 478 A.2d at 380-81. See *Rubanick v. Witco Chemical Co.*, 125 N.J. 421, 447, 593 A.2d 733, 747 (1991).

¹¹⁶ 125 N.J. 421, 593 A.2d 733 (1991).

¹¹⁷ PCB, an acronym for polychlorinated biphenyl, is "any one of a group of poisonous chemicals used in industry as electrical insulators and in plastics manufacture, found in wildlife at levels approaching the concentration of DDT and similar insecticides." *THE WORLD BOOK DICTIONARY* 1615 (Clarence L. Barnhart & Robert K. Barnhart eds., 1980).

¹¹⁸ *Rubanick*, 125 N.J. at 424, 593 A.2d at 734.

¹¹⁹ *Id.* at 452, 593 A.2d at 749. The court did not suggest that non-physicians should automatically qualify as expert witnesses. *Id.* at 453, 593 A.2d at 750. The court posited, however, that courts should scrutinize an expert's reliability and credibility and direct the factfinder accordingly. *Id.*

only measure of reliability.¹²⁰ In evaluating the admissibility of scientific testimony, the court noted, the trial judge should examine the soundness of the expert's methodology but not the soundness of his ultimate conclusion.¹²¹ The court, adhering to the *Ryan* holding, stated that it is irrelevant whether the trial judge believes that reliance on the underlying data is reasonable.¹²² Rather, the court articulated, the trial court need consider only whether comparable experts would arrive at the same conclusion.¹²³

In arriving at this decision, the New Jersey Supreme Court recalled its ruling in *Kelly*.¹²⁴ According to the *Rubanick* court, the holding in *Kelly* represented a previous willingness to recognize a relatively new and undeveloped scientific theory, i.e., battered woman's syndrome.¹²⁵ The *Rubanick* court acknowledged that the abandonment of the general acceptance standard was a bold departure.¹²⁶ The *Rubanick* majority concluded that sound reasons existed for utilizing a broadened standard to determine the admissibility and reliability of scientific hypotheses which establish causation in toxic tort cases.¹²⁷

Against this backdrop of judicial precedent, the *Landrigan* court assessed the reliability of utilizing epidemiological evidence to establish a causal connection between asbestos exposure and colon cancer.¹²⁸ The *Landrigan* court focused on two issues: (1)

¹²⁰ *Id.* at 449, 593 A.2d at 747-48. Additionally, the court held that the proponent of a toxic tort claim can rely on a theory of causation that has not achieved general acceptance in the scientific community, provided that the theory rests upon "a sound, adequately-founded scientific methodology involving data and information of the type reasonably relied on by experts in the scientific field." *Id.*

¹²¹ *Id.* at 449-50, 593 A.2d at 748.

¹²² *Id.* at 452, 593 A.2d at 749 (citing *Ryan v. KDI Sylvan Pools Inc.*, 121 N.J. 276, 289, 579 A.2d 1241, 1247 (1990)). For a detailed analysis of the *Ryan* court's reasoning, see *supra* notes 65-73 and accompanying text.

¹²³ *Rubanick*, 125 N.J. at 452, 593 A.2d at 749 (citing *Ryan*, 121 N.J. at 289, 579 A.2d at 1247).

¹²⁴ *Id.* at 447, 593 A.2d at 747 (citing *State v. Kelly*, 97 N.J. 178, 478 A.2d 364 (1984)). See *supra* notes 105-15 and accompanying text (discussing the seminal *Kelly* decision).

¹²⁵ *Rubanick*, 125 N.J. at 447, 593 A.2d at 747 (citing *Kelly*, 97 N.J. at 190-214, 478 A.2d at 369-82).

¹²⁶ *Id.* at 433, 593 A.2d at 739.

¹²⁷ *Id.* at 454, 593 A.2d at 750.

¹²⁸ *Landrigan v. Celotex Corp.*, 127 N.J. 404, 413-23, 605 A.2d 1079, 1083-89 (1992). Prior to the supreme court's ruling in *Landrigan*, the most comprehensive analysis of epidemiological evidence by any New Jersey court appeared in *Landrigan v. Celotex Corp.* and *Grassis v. Johns-Manville Corp.* See *Landrigan v. Celotex Corp.*, 243 N.J. Super. 449, 579 A.2d 1268 (App. Div. 1990); *Grassis v. Johns-Manville Corp.*, 248 N.J. Super. 446, 591 A.2d 671 (App. Div. 1991). In *Grassis*, the plaintiff sued his employer claiming that on the job exposure to asbestos dust caused him to develop co-

whether Dr. Sokolowski's testimony was reliable; and (2) whether Dr. Wagoner, a non-physician, was qualified to testify as to the proximate cause of the decedent's illness.¹²⁹ Writing for a unanimous court, Justice Pollock began the analysis by reiterating the three-part interpretation of Rule 56(2) set forth in *Kelly*.¹³⁰ The justice noted that the court's inquiry would concentrate on the last two elements of this rule, which address the reliability of expert testimony and the qualifications of witnesses.¹³¹

Justice Pollock explained that the New Jersey Supreme Court's holding in *Rubanick v. Witco Chemical Corp.* provided a proper framework within which *Landrigan* could be decided.¹³² The jus-

lon cancer. *Grassis*, 248 N.J. Super. at 449, 591 A.2d at 672-73. To support this claim, the plaintiff presented Dr. Susan Daum as an expert witness. *Id.* at 450, 591 A.2d at 673. The *Grassis* court set out to determine under what conditions a physician could utilize epidemiological evidence to establish a causal connection between a disease and the environmental factor suspected of causing it. *Id.* at 451, 591 A.2d at 674. The court distinguished *Grassis* from other cases addressing the admissibility of epidemiological evidence on the ground that the expert in *Grassis* was a medical doctor, as well as an epidemiologist. *Id.* As a result, the court explained, the expert had analyzed epidemiological studies in conjunction with personal medical observations about the cause of the plaintiff's colon cancer. *Id.* Holding that the doctor's testimony as to causation was improperly excluded, the appellate division declared that an epidemiologist cannot testify that asbestos, more likely than not, caused a given individual's colon cancer. *Id.* at 454, 591 A.2d at 675, 676 (citing *Landrigan*, 243 N.J. Super. at 462, 579 A.2d at 1274). The court ruled that only a physician or other professional who has actually examined a particular plaintiff can testify as to the cause of the plaintiff's disease. *Id.* at 454, 591 A.2d at 675. Because the doctor in *Grassis* did not base her opinion solely upon epidemiological studies, the court found that her conclusions were not inadmissible as net opinions. *Id.* at 456, 591 A.2d at 676. The appellate division in *Grassis* and the supreme court in *Landrigan*, however, agreed that a risk factor of 2.0 is not a prerequisite to an expert relying upon a particular study to demonstrate causation. Compare *Grassis*, 248 N.J. Super. at 455-56, 591 A.2d at 676 with *Landrigan*, 127 N.J. at 419, 605 A.2d at 1087.

¹²⁹ *Landrigan*, 127 N.J. at 412, 605 A.2d at 1083. Justice Pollock explained: Epidemiology, then, relates to two aspects of plaintiff's proof. For the physician, Dr. Sokolowski, epidemiological studies provided some of the facts on which he relied to conclude that asbestos exposure had caused decedent's colon cancer. Concerning Dr. Wagoner, the epidemiologist, the main issue was whether he was qualified as a non-physician to render an opinion that the exposure had been the cause of decedent's cancer.

Id.

¹³⁰ *Id.* at 413, 605 A.2d at 1084. For a complete discussion of the *Kelly* standard, see *supra* notes 105-15 and accompanying text.

¹³¹ *Id.* at 413, 605 A.2d at 1084.

¹³² *Id.* at 413-14, 605 A.2d at 1084. Specifically, the court stated:

[I]n toxic-tort litigation, a scientific theory of causation that has not yet reached general acceptance may be found to be sufficiently reliable if it is based on a sound, adequately-founded scientific methodology involving data and information of the type reasonably relied on by experts in the scientific field. The evidence of such scientific knowledge must be

tice pointed out that under the *Rubanick* formulation, the admissibility of scientific evidence depends upon the soundness of the expert's reasoning and methodology.¹³³ When determining admissibility, the *Landrigan* court warned, trial judges should not use their own judgment regarding the logic of the expert's conclusion.¹³⁴ Rather, Justice Pollock emphasized, the threshold inquiry is whether a comparable expert would approve the methodology.¹³⁵ The court indicated that the trial judge must function as a critical observer, capable of distinguishing a credible scientific theory from self-validating "junk science."¹³⁶

After setting forth the governing standard, Justice Pollock explained the issue of causation in toxic tort litigation and the role of epidemiology therein.¹³⁷ The nature of the injury in a toxic tort case, the justice stressed, renders traditional methods of cause-and-effect proof inoperative.¹³⁸ Justice Pollock observed that, as a result, plaintiffs must rely on more general evidence, i.e., statistical inferences of the kind produced by epidemiological research.¹³⁹ The court noted, however, that the mere existence of a statistical correlation is not enough to establish causation.¹⁴⁰ Rather, the court proposed, a statistical association must rise to a certain level to be accepted as proof of a causal relation.¹⁴¹

proffered by an expert who is sufficiently qualified by education, knowledge, training, and experience in the specific field of science. The expert must possess a demonstrated professional capability to assess the scientific significance of the underlying data and information, to apply the scientific methodology, and to explain the bases for the opinion.

Id. (citing *Rubanick v. Witco Chemical Corp.*, 125 N.J. 421, 449, 593 A.2d 733, 747-48 (1991)).

Justice Pollock noted that the appellate division had handed down its opinion in *Landrigan* before the supreme court had decided *Rubanick*. *Id.*

¹³³ *Id.* at 414, 605 A.2d at 1084 (citing *Rubanick*, 125 N.J. at 449, 605 A.2d at 747-48) (stating that "*Rubanick* changed the emphasis for the admission of expert testimony from general acceptance in the scientific community to the methodology and reasoning supporting the testimony").

¹³⁴ *Id.* at 414, 421, 605 A.2d at 1084, 1088.

¹³⁵ *Id.* at 421, 605 A.2d at 1088.

¹³⁶ *Id.* at 414, 605 A.2d at 1084 (citations omitted). For a general discussion of the term "junk science" and the abuse of expert testimony, see Epstein & Klein, *supra* note 3, at 656-64.

¹³⁷ *Landrigan*, 127 N.J. at 415, 605 A.2d at 1085.

¹³⁸ *Id.*

¹³⁹ *Id.* The court defined epidemiology as the study of the "relationship between a disease and a factor suspected of causing the disease, using statistical methods to determine the likelihood of causation." *Id.* (citing Black & Lilienfeld, *supra* note 6, at 750).

¹⁴⁰ *Id.*

¹⁴¹ *Id.* (quoting GARY D. FRIEDMAN, PRIMER OF EPIDEMIOLOGY at 182-83 (3d ed. 1987)) ("[S]tatistical associations do not necessarily imply causation. . . . It is impor-

Recognizing that the trial judge is no more equipped than the average juror to assess the strength of a statistical association, the *Landrigan* court provided a means of evaluating whether epidemiological evidence meets the standard of admissibility.¹⁴² At a Rule 8 hearing, Justice Pollock advised, an expert must present the facts underlying his conclusion, explain the methodology utilized in arriving at that conclusion and prove that both the facts and the methodology are reliable.¹⁴³ The justice suggested that trial judges personally review the epidemiological studies relied on by experts.¹⁴⁴ Finally, Justice Pollock counseled, guidance could also be obtained by weighing the extent of the witness' expertise.¹⁴⁵ The

tant, therefore, to have some basis for deciding whether a statistical association derived from an observational study represents a cause-and-effect relationship"). The *Landrigan* court agreed with defendants' assertion that one must consider the strength of a statistical association and the consistency with other scientific findings. *Id.* at 416, 605 A.2d at 1085. The court, however, disagreed with the defendants' contention that epidemiological evidence must demonstrate an attributable risk of fifty percent and a relative risk higher than 2.0 to form a reliable basis for expert testimony. *Id.* at 419, 605 A.2d at 1087. In rejecting the argument, Justice Pollock pointed out that

under certain circumstances a study with a relative risk of less than 2.0 could support a finding of specific causation. Those circumstances would include, for example, individual clinical data, such as asbestos in or near the tumor or a documented history of extensive asbestos exposure. So viewed, a relative risk of 2.0 is not so much a password to finding causation as one piece of evidence, among others, for the court to consider in determining whether the expert has employed a sound methodology in reaching his or her conclusion.

Id. See *supra* note 11 (discussing epidemiological terminology, including the significance of an attributable risk factor).

Until recently, commentators have generally noted that an attributable risk must exceed fifty percent to be of any value in proving causation. Black & Lilienfeld, *supra* note 6, at 767. The appellate division's ruling in *Landrigan* adopted this position. *Landrigan v. Celotex Corp.*, 243 N.J. Super. 449, 459, 579 A.2d 1268, 1272 (App. Div. 1990) (declaring that a relative risk factor of 1.5 and an attributable risk factor of thirty-five percent was not sufficient to establish causation). According to the New Jersey Appellate Division, epidemiological evidence is admissible on its own merit only if the evidence is supported by a high risk ratio. *Grassis v. Johns-Manville Corp.*, 248 N.J. Super. 446, 456, 591 A.2d 671, 676 (App. Div. 1991). Epidemiological evidence which does not reach this threshold can be used only in conjunction with more particularized evidence. *Id.*

¹⁴² *Landrigan*, 127 N.J. at 417-21, 605 A.2d at 1086-88.

¹⁴³ *Id.* at 417, 605 A.2d at 1086. The *Landrigan* court suggested that the proposed method of evaluating testimony will help the trial judge determine whether expert testimony assists the jury in comprehending the evidence and deciding issues of fact. *Id.* See *supra* note 28 for the text of Rule 8.

¹⁴⁴ *Landrigan*, 127 N.J. at 417, 605 A.2d at 1086. Justice Pollock listed other sources that a trial judge may consult when evaluating reliability, including texts, professional journals, symposia, conferences, recognized professional societies and other judicial opinions. *Id.* (citing *State v. Kelly*, 97 N.J. 178, 210-11, 478 A.2d 364, 380 (1984)).

¹⁴⁵ *Id.* (citation omitted).

court concluded that when the above requirements are met, a plaintiff may properly rely upon epidemiological studies, presented in concert with other more particularized evidence, to establish causation.¹⁴⁶

Justice Pollock then focused on the testimony of the two experts in the case at bar.¹⁴⁷ Analyzing Dr. Sokolowski's methodology, Justice Pollock explained that the doctor's strategy involved balancing the decedent's exposure against the absence of other risk factors.¹⁴⁸ After outlining the specifics of Dr. Sokolowski's reasoning process, the court detailed certain guidelines for the trial court to follow on remand.¹⁴⁹ Justice Pollock suggested that the trial court review the validity of the epidemiological studies upon which the doctor based his conclusion.¹⁵⁰ The justice further recommended that the trial court determine if other members of the scientific community approved of Dr. Sokolowski's reasoning.¹⁵¹

In contrast to the treatment of Dr. Sokolowski's testimony, the court quickly resolved the controversy surrounding Dr. Wagoner's testimony.¹⁵² Justice Pollock explained that the *Rubanick* decision stands for the proposition that an otherwise qualified "non-physician" can proffer evidence of causation within the context of toxic tort litigation.¹⁵³ The court, therefore, declared that on remand, Dr. Wagoner's testimony should be admitted into evidence, pro-

¹⁴⁶ *Id.* at 417-18, 605 A.2d at 1086.

¹⁴⁷ *Id.* at 418, 605 A.2d at 1086.

¹⁴⁸ *Id.* at 420, 605 A.2d at 1087-88. The court noted that Dr. Sokolowski based his opinion, in part, on an epidemiological study which suggested that thirty-five percent of colon cancer patients who suffer sustained exposure to asbestos contracted the cancer as a result of that exposure. *Id.* at 418, 605 A.2d at 1086. Next, the court observed, Dr. Sokolowski evaluated the decedent's medical history, an endeavor which enabled him to eliminate other risk factors, including a familial predisposition to colon cancer and consumption of fat-enriched foods or excessive alcohol. *Id.* at 418, 420, 605 A.2d at 1086, 1087-88.

¹⁴⁹ *Id.* at 420-21, 605 A.2d at 1088.

¹⁵⁰ *Id.* at 420, 605 A.2d at 1088. The justice then advised the trial court to ascertain whether the decedent's level of exposure was comparable to that of the study group. *Id.* The court indicated that the trial judge should "also verify Dr. Sokolowski's assumption concerning the absence of other risk factors." *Id.* at 420-21, 605 A.2d at 1088.

¹⁵¹ *Id.* at 421, 605 A.2d at 1088.

¹⁵² *See id.* at 421-22, 605 A.2d at 1088-89.

¹⁵³ *Id.*, 605 A.2d at 1088 (citing *Rubanick v. Witco Chemical Corp.*, 125 N.J. 421, 593 A.2d 733 (1991)). In *Rubanick*, Justice Pollock explained, the court allowed a biochemist who was not a physician, to testify that exposure to PCBs caused the plaintiff's colon cancer. *Id.* at 421, 605 A.2d at 1088 (citing *Rubanick*, 125 N.J. at 452, 593 A.2d at 749). Apparently, the court stated, even the *Landrigan* defendants acknowledged that *Rubanick* permits an otherwise qualified non-physician to testify as to causation. *Id.*

vided it meets the same requirements as Dr. Sokolowski's.¹⁵⁴

Subsequently, the supreme court ruled that the epidemiological evidence relied upon by the two experts could be used to establish causation if the applicable standards of admissibility were met.¹⁵⁵ After analyzing the standards applied by the trial court, the *Landrigan* court articulated that the trial judge should have evaluated only the soundness of Dr. Sokolowski's methodology and should not have barred Dr. Wagoner's testimony about causation simply because he was not a medical doctor.¹⁵⁶ In remanding the matter, the court emphasized that the trial judge could reach the same result as the appellate division after appraising the testimony in light of the court's holding.¹⁵⁷

The admissibility of scientific evidence in toxic tort litigation presents one of the many challenges of modern jurisprudence.¹⁵⁸ When a supreme judicial body inevitably addresses this evidentiary issue,¹⁵⁹ the court must fashion a policy that favors either the plain-

¹⁵⁴ *Id.* at 422, 605 A.2d at 1088-89. Justice Pollock noted that other jurisdictions permit an otherwise qualified non-physician to testify as to causation. *Id.* at 423, 605 A.2d at 1089 (citing *In re Paoli R.R. Yard PCB Litigation*, 916 F.2d 829, 855-56 (3d Cir. 1990) (allowing testimony from toxicologist, microbiologist and physicist); *Valiulis v. Scheffels*, 547 N.E.2d 1289, 1296-97 (Ill. App. Ct. 1989) (permitting a clinical psychologist/neuropsychologist to testify); *Loudermill v. Dow Chemical Co.*, 863 F.2d 566, 570 (8th Cir. 1988) (allowing testimony from a toxicologist); *Karasik v. Bird*, 470 N.Y.S.2d 605, 608 (1984) (allowing testimony from a pharmacologist); *Nicholas v. City of Alton*, 437 N.E.2d 757, 760 (Ill. App. Ct. 1982) (permitting a toxicologist/biochemist to testify); *Roberts v. United States*, 316 F.2d 489, 492-93 (3d Cir. 1963) (allowing testimony from industrial hygienist and toxicologist)).

¹⁵⁵ *Id.* at 417-18, 605 A.2d at 1086.

¹⁵⁶ *Id.* at 420, 422, 605 A.2d at 1088, 1088-89.

¹⁵⁷ *Id.* at 422, 605 A.2d at 1088. The justice stressed that the application of statistical inferences is essential in toxic tort litigation. *Id.* The justice, however, cautioned that statistical evidence must nonetheless meet the reasonableness standard to earn admission. *Id.* This important determination, Justice Pollock concluded, rests with the trial judge. *Id.*

¹⁵⁸ See Gold, *supra* note 4, at 376.

¹⁵⁹ The New Jersey Supreme Court was ahead of many courts in reaching this issue. Indeed, the United States Supreme Court has only recently addressed the admissibility of expert testimony. Acting in its capacity as final interpreter of the Federal Rules of Evidence, the Supreme Court in *Daubert v. Merrell Dow Pharmaceuticals* rejected the *Frye* standard, holding instead that Federal Rule of Evidence 702 enunciates the threshold for admitting scientific testimony in the federal courts. *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, No. 92-102, 1993 WL 224478, at *4 (U.S. June 28, 1993).

In *Daubert*, the plaintiffs, two minor children and their parents, filed suit against Merrell Dow, alleging that the mothers' ingestion of Bendectin while pregnant had resulted in serious birth defects to the children. *Id.* at *2. In opposition to Merrell Dow's motion for summary judgment, the plaintiffs proffered the testimony of eight impressively-credentialed experts, each of whom concluded that Bendectin can cause birth defects. *Id.*

The United States District Court for the Southern District of California nonethe-

less granted Merrell Dow's motion, holding that the experts' opinions, based as they were upon animal studies, chemical structure analyses, and the unpublished "reanalysis" of previously published epidemiological studies, did not meet the standard of general acceptance. *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 727 F. Supp. 570 (S.D. Cal. 1989). Citing *Frye*, the United States Court of Appeals for the Ninth Circuit affirmed. *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 951 F.2d 1128 (9th Cir. 1991). The Supreme Court granted certiorari in order to reconcile the sharply divergent positions of the federal circuits regarding the appropriate standard for admission of scientific testimony. *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 113 S. Ct. 320 (1992). Reversing the decisions of the lower courts and remanding the matter for further proceedings in accordance with its opinion, the Supreme Court held that adoption of Federal Rule of Evidence 702 superceded the *Frye* standard. *Daubert*, 1993 WL 224478, at *4. The Court further held that Federal Rule of Evidence 702 imposes two requirements on expert scientific testimony: (1) that the testimony pertain to scientific knowledge; and (2) that the testimony assist the trier of fact to understand or determine a fact in issue. *Id.* at *5-6.

Writing for the majority, Justice Blackmun began by diffusing the importance of *Frye*. *Id.* at *4. The Justice stated that the promulgation of the Federal Rules of Evidence superceded *Frye*. *Id.* The Court further noted that neither the text nor the drafting history of the rules indicate an assimilation of the general acceptance standard. *Id.* In fact, the Court observed that the rigidity of the *Frye* standard runs contrary to the liberal underpinnings of the Federal Rules of Evidence. *Id.* According to the majority, Federal Rule of Evidence 402 captures the essence of this liberal thrust: "All relevant evidence is admissible, except as otherwise provided by the Constitution of the United States, by Act of Congress, by these rules, or by other rules prescribed by the Supreme Court pursuant to statutory authority." *Id.* (quoting FED. R. EVID. 402). The majority proposed that the limitations of the general acceptance standard contradict the liberal approach codified in the Federal Rules of Evidence. *Id.* The Court, therefore, expressly rejected *Frye* as the standard for admitting scientific testimony. *Id.* at *5.

After determining which standard governs the admission of expert testimony, the Court next set forth the requirements of that standard. *Id.* at *5-6. According to the Court, a trial judge must make a two-part rule 104(a) determination. *Id.* at *6. The Court stated that the judge must make certain that the expert's proposed testimony (1) relates to scientific knowledge, and (2) will assist the trier of fact to determine a fact in issue. *Id.* Justice Blackmun explained that scientific knowledge requires "a grounding in the methods and procedures of science." *Id.* at *5. The Justice further expounded that scientific knowledge suggests more than unfounded speculation. *Id.* Noting that scientific certainty is neither expected nor required, the majority concluded that an inference or assertion can qualify as scientific knowledge if it is reached by a scientific method, if it is supported by appropriate validation, and if it is based on known facts. *Id.*

The Court emphasized, however, that scientific knowledge is not admissible unless it has a logical connection to a fact in issue. *Id.* at *5-6. The majority essentially reiterated the language of Federal Rule of Evidence 702, which provides that expert testimony must "assist the trier of fact to understand or determine a fact in issue." *Id.* at *5. The Court labelled this requirement as one of relevancy. *Id.* The Court explained that scientific knowledge must bear relevantly on a pertinent inquiry in order to be admissible. *Id.* at *6.

After articulating the two-part inquiry embodied in Federal Rule of Evidence 702, Justice Blackmun next provided a list of four factors intended to help the trial judge assess the scientific validity of the reasoning and methodology underlying an expert's testimony. *Id.* at *6-7. The Justice interjected, however, that the list of factors is neither exhaustive nor dispositive. *Id.* at *6. The majority suggested that the trial

tiff or the defendant.¹⁶⁰ The standard enunciated by the court in

judge consider: (1) whether a scientific theory can be tested; (2) whether a theory has been subjected to peer review and/or publication; (3) whether a particular theory has a known or potential rate of error; and (4) whether a theory has attained a degree of acceptance in the scientific community. *Id.* at *6-7. The Court cautioned that because the Federal Rules of Evidence advocate a flexible approach, these factors must be applied to the principles and methodology employed by an expert, not to the expert's ultimate conclusion. *Id.* at *7.

In closing, the Court further advised that a trial judge may take guidance from three other sources. *Id.* The Court reminded the trial judge of the reasonable reliability standard embodied in Federal Rule of Evidence 703. *Id.* The majority also advocated calling an expert of the trial court's own choosing pursuant to Federal Rule of Evidence 706. *Id.* Finally, the majority recalled a trial court's right under Federal Rule of Evidence 403 to exclude relevant evidence on grounds of prejudice or confusion. *Id.* Thus, with confidence in the judicial system's ability to distinguish admissible from inadmissible evidence, the Court rejected the long-standing *Frye* test in favor of the more liberal approach of the Federal Rules of Evidence. *Id.* at *7-8.

Chief Justice Rehnquist filed a separate opinion, in which Justice Stevens joined, concurring in part and dissenting in part. *Id.* at *10 (Rehnquist, C.J., concurring in part and dissenting in part). Chief Justice Rehnquist agreed that *Frye* was superceded by the enactment of the Federal Rules of Evidence. *Id.* The Chief Justice disagreed, however, with the majority's decision to provide the trial judge with a list of factors to help inform his or her determination. *Id.* at *11-12 (Rehnquist, C.J., concurring in part and dissenting in part). Chief Justice Rehnquist expressed concern that such observations, offered as they were in the abstract, tend to complicate, not simplify, difficult legal questions. *Id.* at *11 (Rehnquist, C.J., concurring in part and dissenting in part). The Chief Justice contended that the majority had created more questions than it had answered. *Id.* Chief Justice Rehnquist, therefore, believed that the majority should have limited its opinion to the issues of the case and avoided further interpretation of Federal Rule of Evidence 702 until such time as it was required. *Id.* at *12 (Rehnquist, C.J., concurring in part and dissenting in part).

¹⁶⁰ The *Agent Orange* court explained:

Courts have adopted two general approaches to Rule 703: one restrictive, one liberal. The more restrictive view requires the trial court to determine not only whether the data are of a type reasonably relied upon by experts in the field, but also whether the underlying data are untrustworthy for hearsay or other reasons. The more liberal view, . . . allows the expert to base an opinion on data of the type reasonably relied upon by experts in the field without separately determining the trustworthiness of the particular data involved.

In re Agent Orange Product Liability Litigation, 611 F. Supp. 1223, 1243-44 (E.D.N.Y. 1985), *aff'd*, 818 F.2d 187 (2d Cir. 1987), *cert. denied sub nom. Lombardi v. Dow Chemical Co.*, 487 U.S. 1234 (1988) (citations omitted).

An approach that favors the defendant appears to have two primary characteristics. First, the "pro-defendant" approach will likely adopt the general acceptance standard. *See Frye v. United States*, 293 F. 1013, 1014 (D.C. Cir. 1923) (pronouncing the general acceptance standard); Moenssens, *supra* note 75, at 545 (stating that some courts regard the *Frye* standard as an obstacle to the admission of evidence that is based on new scientific theories). The general acceptance standard precludes the introduction of expert testimony which is not approved by a substantial proportion of the scientific community. *See Giannelli*, *supra* note 75, at 1210-11. Giannelli further explained:

The percentage of those in the field who must accept the technique has never been clearly delineated. Most courts applying *Frye* have not ad-

Landrigan represents New Jersey's attempt to fashion a "pro-plaintiff" approach.¹⁶¹ The *Landrigan* court's decision has merit. Because the nature of science is such that there will never be a majority of experts advocating the same theory, there is no question that the toxic tort plaintiff faces the near impossible when asked to prove a generally accepted theory of causation. For example, the media constantly bombards the public with news of studies on the possible environmental and dietary causes of various cancers, only to report a short time later contradictory medical findings. If the general acceptance standard were to remain in effect, then legitimately harmed plaintiffs would often be unable to recover damages.

An additional benefit of the *Landrigan* standard is that it provides the trial judge with guidelines for assessing reasonable reliability.¹⁶² Just as opposing attorneys can arrive at differing yet sound conclusions when analyzing the same legal principle, so too may experts reach discordant opinions when evaluating the same data. In that situation, the judge need only concern himself with the reliability of the expert's methodology.¹⁶³ To that end, the *Landrigan*

dressed the issue adequately; they have either ignored it altogether or offered rather general statements. For example, one court has defined general acceptance as "widespread; prevalent; extensive though not universal." Another court has conceded that "a degree of scientific divergence of view is inevitable," without elaborating on how much divergence would be dispositive.

Id. (quoting *United States v. Zeiger*, 350 F. Supp. 685, 688 (D. D.C.), *rev'd*, 475 F.2d 1280 (D.C. Cir. 1972); *Commonwealth v. Lykus*, 327 N.E.2d 671, 678 n.6 (Mass. 1975)). In the ever-expanding area of cancer research, for example, it is highly unlikely that one theory of causation will ever earn the universal acceptance of the medical establishment. Thus, the general acceptance standard may leave the proponent of a toxic tort claim with little or no means of establishing proximate cause.

The "pro-defendant" position is further characterized by a manifest lack of confidence in the concept of the objective jury. *See supra* notes 75-79 and accompanying text (discussing *Frye* and the application of the general acceptance standard). Particularly, the general acceptance theory undervalues a jury's ability to distinguish reliable from unreliable testimony and places the decision in the hands of the judge. *See Moenssens, supra* note 75, at 545. Once the judge determines that evidence is unreliable according to the requirements of general acceptance, the jury is barred from placing any value of its own on the testimony. *Id.*

An approach that favors the plaintiff, on the other hand, seeks to limit the trial judge's veto power and reduces the emphasis on what percentage of the scientific community supports the expert's opinion. *See supra* notes 43-51, 58-73 and accompanying text (discussing the limitations that the liberal approach to admissibility places on the trial judge).

¹⁶¹ *See Landrigan v. Celotex Corp.*, 127 N.J. 404, 605 A.2d 1079 (1992).

¹⁶² *See supra* notes 142-50 and accompanying text (outlining the judicial guidelines established by the *Landrigan* court).

¹⁶³ *Landrigan*, 127 N.J. at 422, 605 A.2d at 1088-89.

court even refers the judge to certain sources which may enlighten his decision.¹⁶⁴

Unfortunately, the *Landrigan* standard will not achieve its essential goal of clarifying the admission process and limiting the judge's role therein because much of the determination is still left to the judge's discretion.¹⁶⁵ A judge has the authority to review all the steps that lead to an expert's conclusion.¹⁶⁶ He may examine the plaintiff's medical profile, the studies the expert relied on and any applicable literature in the area of expertise.¹⁶⁷ Although the judge may not substitute his own conclusion for that of the expert, the judge is required to assess the reasonableness of the expert's methodology.¹⁶⁸ The *Landrigan* standard provides only guidelines and no brightline test for making that determination. Thus, a judge's ruling on admissibility will stand unless the plaintiff can prove on appeal that it is plain error or that the judge abused his discretion.

The New Jersey Supreme Court's ruling in *Landrigan* clearly liberalizes the requirements for the admission of scientific testimony in toxic tort litigation. On its face, the ruling appears to make it easier for plaintiffs to meet their burden of proving causation, but in reality defendants may benefit as well.¹⁶⁹ A defendant

¹⁶⁴ See *id.* at 417, 605 A.2d at 1086. Such sources included professional journals, text books, symposia and other judicial opinions. *Id.*

¹⁶⁵ See *id.* at 420-21, 605 A.2d at 1087-88.

¹⁶⁶ See *id.*

¹⁶⁷ See *id.*

¹⁶⁸ See *id.* at 414, 605 A.2d at 1084.

¹⁶⁹ See *Dafler v. Raymark Industries, Inc.*, 259 N.J. Super. 17, 36, 611 A.2d 136, 146 (1992). *Landrigan* and its companion case, *Caterinicchio v. Pittsburgh Corning Co.*, were relied upon by the appellate division to formulate its holding in *Dafler*. *Id.*; see *supra* note 16 (discussing the *Caterinicchio* case). In *Dafler*, the plaintiff claimed that he had developed lung cancer and asbestosis as a result of a six year occupational exposure to asbestos. *Dafler*, 259 N.J. Super. at 21, 611 A.2d at 138. Plaintiff, however, admitted that he had also smoked one pack of cigarettes every day for forty-five years. *Id.* at 25, 611 A.2d at 140. At trial, the plaintiff presented two expert witnesses who testified that the plaintiff's lung cancer had been induced by exposure to asbestos, but acknowledged that cigarette smoking is presently the single greatest cause of lung cancer in the United States. *Id.* at 25-26, 611 A.2d at 140. The plaintiff's experts based their conclusions upon epidemiological studies, which linked asbestos exposure to lung cancer. *Id.* at 25, 611 A.2d at 140. The defendant's expert also relied upon epidemiological data which established the strong causal connection between lung cancer and cigarette smoking. *Id.* at 25-26, 611 A.2d at 140-41. The jury returned a verdict in favor of the plaintiff for liability and damages. *Id.* at 21, 611 A.2d at 138. The jury, however, found that plaintiff's lung cancer was seventy percent attributable to cigarette smoking. *Id.* at 21, 26-27, 611 A.2d at 138, 141. The plaintiff appealed contending that the evidence did not provide the jury with a reasonable basis for apportionment. *Id.* at 22, 611 A.2d at 138.

The appellate division endorsed the position of § 433A of the Restatement (Sec-

may seek to introduce epidemiological evidence, either to contradict that of the plaintiff or to prove that another causative agent present in plaintiff's environment had a comparable or even greater statistical correlation to the plaintiff's condition.¹⁷⁰ Because the courts have already demonstrated a willingness to apply the *Landrigan* holding in this way, its effect may not be entirely "pro-plaintiff."¹⁷¹

Christine M. Gurry

ond) of Torts on apportionment. *Id.* at 28, 611 A.2d at 141. Section 433A of the Restatement (Second) of Torts provides: "(1) Damages for harm are to be apportioned among two or more causes where (a) there are distinct harms, or (b) there is a reasonable basis for determining the contribution of each cause to a single harm. (2) Damages for any other harm cannot be apportioned among two or more causes." RESTATEMENT (SECOND) OF TORTS § 433A (1966). Relying upon § 433A, the appellate division affirmed the verdict, stating that the 70/30 split between smoking and asbestos on causation was in line with statistical associations revealed by epidemiological research. *Dafler*, 259 N.J. Super. at 28-29, 35-36, 611 A.2d at 141-42, 145-46. The court, therefore, held that a reasonable basis for determining apportionment did exist. *Id.* at 35, 611 A.2d at 145. This ruling effectively permitted toxic tort defendants to employ the *Landrigan* standard in order to balance the scales which *Landrigan* itself had tipped in favor of the plaintiff. Roy Alan Cohen & Frank Fazio, *Sharing Damages in Multiparty Toxic Tort Cases*, 132 N.J.L.J. 370, 390 (October 19, 1992). In other words, if plaintiffs can use epidemiological evidence to establish causation, defendants can use it to refute causation or, at the very least, apportion it among other causative agents. *Id.*

¹⁷⁰ See *Dafler*, 259 N.J. Super. at 36, 611 A.2d at 146.

¹⁷¹ See *id.* See also Cohen & Fazio, *supra* note 169, at 390. Cohen and Fazio observed: With the Appellate Division's decision in *Dafler*, the trend continues toward submitting scientific and epidemiologic evidence to the jury as a factor to be considered in deciding issues of causation. Certainly, the New Jersey Supreme Court's decisions in *Landrigan* and *Caterinicchio* represent that approach from the plaintiff's standpoint, and the Appellate Division decision in *Dafler* serves to support this trend from the defense standpoint.

Id.