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Factual Causation in Toxic Tort Litigation: A Philosophical View of Proof and Certainty in Uncertain Disciplines

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ARTICLES

FACTUAL CAUSATION IN TOXIC TORT LITIGATION: A PHILOSOPHICAL VIEW OF PROOF AND CERTAINTY IN UNCERTAIN DISCIPLINES

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I. INTRODUCTION

The headline reads: "Town clenched in suffocating grip of asbestos: W.R. Grace & Co. closed its vermiculite mine in Libby, Mont[ana], 10 years ago, but hazardous material was embedded in the ore. Experts attribute many cases of lung disease to what they call secondary exposure."[1] Lately, exposure to toxic substances and harm to human health and the environment have become the norm, not the exception. Within the United States and its territories alone, environmental groups, as well as individuals, have documented the proliferation of harmful exposure to toxic

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1. John Ritter, *Town Clenched in Suffocating Grip of Asbestos*, USA TODAY, Feb. 1, 2000, at 8A.

substances from as far away as Kaho'olawe, Hawai'i,[2] to as close as Kelley Air Force Base in San Antonio, Texas.[3]

While exposure to toxic substances has become the norm, findings of culpability against those responsible for creating the exposure and any ensuing harm seem to be nonexistent. The reasons for this lack of accountability rest in a judicial system that has posed insurmountable standards for toxic exposure plaintiffs who must hurdle myriad procedural and substantive obstacles just to get through the courthouse doors. One of these hurdles is proof of causation. In many instances, the judiciary represents a barrier to the only relief that may be available to toxic exposure plaintiffs. While the judiciary does not seem uncaring, its gauntlet of obstacles in the area of causation and proof renders justice for toxic exposure plaintiffs scarce. The tests developing in the judiciary for the causation factor in toxic tort litigation are unrealistically burdensome to plaintiffs and result in the dismissal of meritorious cases.

There is little doubt that the industrial revolution gave birth to a technological era dependent on chemical and pharmaceutical developments, laser advancements, and infrared products, all of which are widely distributed to and consumed, either directly or indirectly, by individuals.[4] The byproducts of this consumption—usually harmful environmental waste—have gone unnoticed or ignored for decades, but consumers are becoming more informed about the effects of technology and its byproducts on the environment and on themselves. For example, in the 1970s, the

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2. In 1920, the United States began bombarding the island. In 1939, the Army leased the southern tip of the island to use as an artillery range. In 1941, the Navy gained exclusive use of the island for gunnery and bombing training. In 1965, the Navy detonated one of the most powerful non-nuclear bombs ever on the island. In 1976, the Protect Kaho'olawe 'Ohana instituted legal action to restore Hawai'ian control of the island. In a settlement agreement, the 'Ohana was able to negotiate for, among other things, the detection and cleanup of unexploded ordnance and other alien debris. *See generally* Global Town's Kaho'olawe, *at http://www.global-town.com/about_hawaii/kahoolawe.htm* (last visited Nov. 16, 2001) (detailing the history of Kaho'olawe).

3. *See* Bill Day & Nicole Foy, *Officials Claim Old Air Force Base Safe Despite Ex-Workers' Diseases*, S.F. CHRON., Dec. 10, 2000, at C10.

4. *See* Elam v. Alcolac, Inc., 765 S.W.2d 42, 175 (Mo. Ct. App. 1988) (recognizing defendant's argument that modern life exposes everyone to countless chemicals and other toxic residues from diverse sources); JULIE DAVIES ET AL., A TORTS ANTHOLOGY 423–35 (2d ed. 1999) (discussing the beginning of products liability law and its attendant policies); *see also* MacPherson v. Buick Motor Co., 111 N.E. 1050 (N.Y. 1916) (recognizing that we live in an organizational society in which traditional common law limitations on an actor's duty must give way to the realities of society).

American working class population became increasingly aware of the dangers of friable asbestos used in all walks of industrial, commercial, and even home life.[5] Because of this awareness and the foresight of scientific researchers, the asbestos industry was required to account for its role in physically[6] and efficiently[7] causing so many to suffer merely because they handled a substandard and ineffective insulation product.[8]

Today, consumers are plagued by more than just substandard products. The byproduct of the use of biological, chemical, and nuclear products is the threat of toxic exposure resulting from substandard manufacturing processes, illegal and unregulated dumping of chemicals and other waste or runoff material,[9] inade-

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5. *Cf.* Ritter, *supra* note 1 (reporting on lung cancer clusters detected in Libby, Montana, where W.R. Grace operated a vermiculite mine that processed asbestos until 1990); *see generally* Borel v. Fibreboard Paper Prods. Corp., 493 F.2d 1076 (5th Cir. 1973) (discussing the dangers of asbestos within the context of a products liability suit).

6. *See* MARIO BUNGE, CAUSALITY: THE PLACE OF THE CAUSAL PRINCIPLE IN MODERN SCIENCE 148 (1963). The physical cause represents linearity theory where one agent finds itself in an active and productive state, while the effect produced by the active agent is a passive consequence. An example of physical cause may be an actor's manufacture of an agent. The active state and the passive consequence combine to represent a peripatetic dichotomy of substances into agents and patients, without simultaneous account for the concept of reactivity theory. As related to toxic causation, traditional legal theory requires adherence to the former linearity theory, which requires proof of traceability. Modern legal theory, however, would attach significance to concepts of reactivity or multi-factor theories, which requires expanded notions of proof to account for causal cycles or webs of causation. *Id.*

7. *Id.* at 5–7. The efficient cause is a clearly conceived concept of motion that can be assigned an empirical correlate, namely an event, which produces another traceable event, that can be deduced either by experience or by empirical testing. The efficient cause, in short, is the actual agent, not the actor, producing some change. *Id.*

8. *See Borel*, 493 F.2d at 1082; *see also* Ritter, *supra,* note 1. Mr. Ritter reports that:

> [m]ore than 200,000 asbestos injury claims are pending in Federal and state courts. Thousands of new cases are filed every year against companies involved in mining and processing asbestos. . . . Grace officials now acknowledge that asbestos from the mine caused lung disease in Libby, Montana, but they deny that the company knew of the dangers but did not tell workers. Mining vermiculite ore, breaking it and crushing it, separating it by size, heating it to produce a type of commercial insulation, packing it for shipping—all these processes created a staggering amount of very fine dust laced with asbestos. Not only did the miners breathe the dust all day, they brought it home on their clothes and in their vehicles. When the kids gave dad a hug, they got a dose of asbestos. Wives did the laundry and shook out the clothes, and the dust spread. One of the unfortunate ironies here is that the asbestos was of no use at all to Grace, which spent a lot of money trying to figure out how to market tremolite from the asbestos processing but found no commercial use. In the end, it was just waste.

Id.

9. *See* Ayres v. Township of Jackson, 525 A.2d 287, 292 (N.J. 1987).

quate or absent warnings about product dangers,[10] and flawed product designs.[11] Unlike asbestos exposure and the resulting industry accountability, current chemical, biological, nuclear, and other product exposures, which are the subject of toxic tort litigation, are not readily or easily associated with their respective sources.[12] These chemicals or products are not readily identifiable as catalysts for various injuries that are alleged to be the result of exposure.[13]

Based upon these difficulties, the only clear observation in toxic tort litigation is the unparalleled dilemma of establishing a cause and effect relationship between a toxin and a plaintiff's injury. This difficulty is magnified by the judiciary's preoccupation with establishing direct traceability in toxic exposure cases to satisfy the causation element. The emphasis on direct traceability, or cause and effect, dominates the law of traditional torts,[14] but toxic tort litigation cases prove that the causation element should not be viewed as a fungible legal standard. Treating the causation element the same in toxic tort cases as in traditional tort cases will undermine society's attempts to achieve deterrence, compensation, or corrective justice in meritorious cases of toxic exposure.[15]

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10. *See Borel*, 493 F.2d at 1093 (concluding that evidence at trial provided ample support that defendant operated its landfill in an unreasonable manner, and the chemical contamination of plaintiffs' wells was caused by defendant's improper operation of its landfill).

11. *See* Lee v. Baxter Healthcare Corp., 721 F. Supp. 89, 95–96 (D. Md. 1989) (alleging claim for strict liability in tort based upon design defect inherent in a breast prosthesis).

12. *See* Ora Fred Harris, Jr., *Toxic Tort Litigation and the Causation Element: Is There any Hope of Reconciliation*, 40 SW. L.J. 909, 912 (1986).

13. *See id.*

14. *Id.*

15. *See* GERALD W. BOSTON & M. STUART MADDEN, LAW OF ENVIRONMENTAL AND TOXIC TORTS: CASES, MATERIALS, AND PROBLEMS 4–20 (1994); *see also* Elam v. Alcolac, Inc., 765 S.W.2d 42, 176 (Mo. Ct. App. 1988) (stating that the traditional and foremost policy of tort law is to deter harmful conduct and to ensure that innocent victims of that conduct will have redress).

> Cognate principles of equity and economic efficiency also inform that policy: that the cost of the pervasive injury which results from mass exposure to toxic chemicals shall be borne by those who can control the danger and make equitable distribution of the losses, rather than by those who are powerless to protect themselves.

Id.

Substantive concerns pervade the law of toxic torts, but none are more troubling than the element of factual causation.[16] Problems with factual causation impact plaintiffs as well as defendants involved in litigating toxic tort cases. Such problems are encountered when dealing with long latency periods, traceability, source or proper defendant identification, and specific toxin identification.

Long latency periods play a significant role in attempting to establish factual causation or to defend against its assertion.[17] Similarly, long latency periods impede a plaintiff's ability to establish a sufficient causal nexus between an actor's conduct and a plaintiff's injury.[18] If a plaintiff can construct a causal nexus between the agent and the host, however, she stands an improved chance of reaching a jury.[19] Long latency periods adversely impact defendants who may be required to respond to allegations of tortious conduct many years after handling a toxin. Accordingly, defen-

16. Under traditional tort theory, factual causation, or causation-in-fact, is measured by one of two tests. The first test is the "but for" test, and the second is the substantial factor test. The "but for" test is defined as an act or omission being the cause of a particular event, if such an event would not have occurred absent the act. W. PAGE KEETON ET AL., PROSSER AND KEETON ON THE LAW OF TORTS § 41, at 265–66 (5th ed. 1984) [hereinafter PROSSER AND KEETON ON TORTS]. The substantial factor test is defined as two or more causes joining together to bring about an event, and if any one of the causes, operating alone, would be sufficient to bring about an event, then each cause must be responsible for the event. In other words, an act or omission is the cause of an event, if it was a material element in bringing about an event. *Id.* at 266–67. Factual causation under either test is considered "peculiarly a question for the jury." *Id.* at 264–65.

17. *See* Johnston v. United States, 597 F. Supp. 374, 426 (D. Kan. 1984) (defining latency as a period of seeming inactivity between time of exposure of tissue to an injurious agent and response); *Elam*, 765 S.W.2d at 173–74; Ayres v. Township of Jackson, 525 A.2d 287, 299 (N.J. 1986).

18. *See* Bert Black & David E. Lilienfeld, *Epidemiologic Proof in Toxic Tort Litigation*, 52 FORDHAM L. REV. 732, 738 (1984) (stating that since most toxic tort cases involve diseases with long latency or incubation periods, and because many of these diseases may occur in the absence of any identifiable exposure, causation very often becomes a central and complex issue at trial).

19. The long latency question is a good example of the confluence between procedural and substantive hurdles in toxic tort exposure cases. As a component of procedure, a long latency period between exposure to an agent or toxin and the contracting of a disease presents statute of limitations dilemmas that may require procedural dismissal or summary judgment. As a component of substance, the same long latency period impacts a plaintiff's ability to present sufficient evidence to satisfy the burden of production of evidence on factual causation. These hurdles in toxic tort cases will remain virtually insurmountable in the absence of normative judicial activism, which could level the playing field between toxic exposure plaintiffs and those defendants likely responsible for the emission of toxic products and byproducts.

dants may have to institute burdensome record-keeping procedures as well as costly toxin identification processes.

Additionally, toxic tort exposure cases present traceability issues that are far more onerous than traceability issues presented in the traditional tort paradigm. In traditional tort cases, plaintiffs rely on the epistemology[20] of physical (an actor's conduct) and efficient causes (the force set in motion), which result in testable consequences, to establish factual causation.[21] In most recent toxic tort cases, victims of toxic exposure are estopped from relying on the epistemology of causes and consequences to satisfy the crucial element of factual causation because courts and commentators fear that toxic tort defendants will be overexposed to liability for conduct that has yet to be completely explained or understood by science.[22] Accordingly, toxic tort plaintiffs are instead required to merge epidemiology,[23] toxicology,[24] medical and clinical sciences,[25] quantitative and qualitative probabilities,[26] physical causation,[27] efficient causation,[28] legal causation,[29] and legal

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20. *See infra* notes 47, 78.

21. The common law requires that the plaintiff establish causation with reasonable certainty and specificity. *See* Harris, *supra* note 12, at 911 (stating that the plaintiff must demonstrate cause-in-fact that comports with either the "but for" test or the "substantial factor" test). Further, the plaintiff must prove by a preponderance of the evidence that "but for" the defendant's conduct, the plaintiff would not have been injured. *Id*; *see also Elam*, 765 S.W.2d at 174 (citing Allen v. United States, 584 F. Supp. 247, 416 (D. Utah 1984)) (stating that "[t]he substantial factor standard . . . is particularly suited to injury from chronic exposure to toxic chemicals where the sequent manifestation of biological disease may be the result of a confluence of causes").

22. *See* Nancy Lee Firak, *Alternative Forms of Liability: Developing Policy Aspects of the Cause-in-Fact Requirement of Tort Law*, 20 ARIZ. ST. L.J. 1041, 1049 (1988) ("[A]llowing recovery for increased risk overexposes defendants to liability, because not every plaintiff who has an increased risk actually develops cancer.").

23. Epidemiology is the study of disease occurrence. It includes the study of associations, measured in terms of disease incidence, between disease and characteristics, i.e., age, habits, and the living conditions of individuals. The goal of epidemiology is to investigate how toxic exposures influence the risk of developing a disease. The traditional components of comparison in epidemiology are the disease occurrence among the exposed population versus the disease occurrence among the unexposed population. *See generally* THOMAS C. TIMMRECK, AN INTRODUCTION TO EPIDEMIOLOGY (2d ed. 1998).

24. Toxicology is the science of the effects, detection, and treatment of poisons. *See* DORLAND'S ILLUSTRATED MEDICAL DICTIONARY (25th ed. 1965).

25. *See infra* notes 86–90; *see also Elam*, 765 S.W.2d at 185 (stating that the diagnosis of disease in the plaintiff consistent with exposure is a subject of medicine).

26. *See infra* note 133.

27. *See supra* note 6.

28. *See supra* note 7. Although traditional tort actions expressly state the causation requirement as factual causation measured by either the "but for" test or the "substantial factor" test and legal causation, the element of causation is not an a priori primary as-

persuasion[30] into one neat package to meet the proof requirements for factual causation, the critical element in most common law tort claims.[31]

Moreover, toxic exposure plaintiffs must also identify the source of the toxin or the actor in control of the toxin prior to exposure.[32] In many cases, the requirement to identify the source of the toxin or the proper defendant may be impossible. Many years may pass from the time the defendant manufactured, processed, or disposed of a toxic substance and the time that the plaintiff's disease or injury surfaces. Thus, a plaintiff may not have access to records or documents that would connect her exposure and injury to a particular source or defendant.

Finally, toxic exposure plaintiffs must also identify the specific

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sumption. Rather, it is an element that is subject to reductionism, particularly within the legal discourse. The components of causation can be described as physical and efficient. *See supra* notes 6–7.

29. *See* Ingram v. Acands, Inc., 977 F.2d 1332, 1340 (9th Cir. 1992) (stating that causation in fact is unrelated to proximate or legal cause). Legal (proximate) cause is sometimes interpreted as the significance and importance of the relationship between the defendant's conduct and the plaintiff's injuries, a lack of which may bar the plaintiff's claim. While the defendant's conduct may be morally or otherwise reprehensible, legal policy mandates that a lack of foreseeability or direct traceability to the plaintiff's injuries should abrogate the defendant's responsibility. *See* PROSSER AND KEETON ON TORTS, *supra* note 16, § 42, at 272–73.

30. *See infra* note 226.

31. Every potentially viable tort claim upon which recovery for toxic exposure is based requires some range of proof on the element of factual causation. The range of available common law tort theories for recovery include, but may not be limited to, the following: trespass, nuisance, strict liability for abnormally dangerous activity, negligence, products liability, and strict products liability. *See* Roger S. Stark, *Common Law Theories of Liability in Toxic Torts*, T.M. COOLEY ENVTL. J., Winter 1999, at 10, 10–15, *available at* http://www.cooleylaw.edu/publications/greenpages/enlwinter99.pdf. More recently, cases illustrate emerging claims like medical monitoring, fear of cancer or fear of enhanced risk of disease, and enhanced risk of disease. *See* James M. Garner et al., *Medical Monitoring: The Evolution of a Cause of Action*, 30 ENVTL. L. REP. 10024 (2000); *see also* Thomas Parker Redick et al., *Fear of Cancer Claims After* Potter v. Firestone, A.B.A. SEC. TOXIC TORTS & ENVTL. LITIG. COMM. NEWSL. 1 (2000). In other cases, litigants rely on intentional tort theories, like toxic assault and battery, conspiracy, and fraud, to recover for toxic exposure and injuries. *See, e.g.*, Koehn v. Ayers, 26 F. Supp. 2d 953, 955 (S.D. Tex. 1998).

32. *See* Sindell v. Abbott Laboratories, 607 P.2d 924, 927 (Cal. 1980). The indeterminate defendant is a causation problem because the plaintiff usually has little or no proof establishing the source, producer, or manufacturer of the toxic substance that is the plausible culprit in bringing about the plaintiff's disease or injury. *Id.* at 929. *Cf. In re* "Agent Orange" Prod. Liab. Litig., 597 F. Supp. 740, 819 (E.D.N.Y. 1984) (establishing as a legal hurdle the inability to identify the manufacturer of the herbicides sprayed in Vietnam, because the United States Government mixed the substances from several manufacturers before spraying).

toxin that produces the type of injury from which they suffer.[33] Toxin identification creates a factual causation problem for plaintiffs if categories of injuries cannot be attributed to the toxin or if categories of injuries can be attributed to other causes as well as the toxin. Because a toxic exposure plaintiff may have encountered various background risks, proving that the specific toxin caused her injury strongly militates against a finding of factual causation in today's legal climate.

In addition to substantive concerns related to factual causation, procedural concerns also exist in establishing proof of factual causation.[34] One concern is the statute of limitations argument raised by a defendant as an affirmative defense to a plaintiff's claims of tortious toxic exposure. Plaintiffs respond that the statute of limitations has not run, because the statute was tolled by the application of the discovery rule.[35] The statute of limitations analysis is far from uncontroversial.

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33. The plaintiff must address that a component of background risk is exposure to toxins, which are a fungible byproduct created from the natural environmental decomposition of the toxin. Some courts do not require the identification of the specific toxin because the burden of proof on the plaintiff would be too great. *See* Earl v. Cryovac, 772 P.2d 725, 732–33 (Idaho Ct. App. 1989); *see also* Elam v. Alcolac, Inc., 765 S.W.2d 42, 179 (Mo. Ct. App. 1988) (holding that the identity of the toxic substances to which the harm is attributed may be shown by circumstantial evidence). *But see* Cottle v. Superior Court of Ventura, 5 Cal. Rptr. 2d 882, 884 (Cal. Ct. App. 1992) (requiring plaintiff to state the chemical or toxic substance to which the plaintiff was exposed); Herrington v. Leaf River Forest Products, Inc., 733 So. 2d 774, 777 (Miss. 1999).

> Where a party, who has the burden of proof, has the power to produce evidence of a more explicit, direct, and satisfactory character than that which he does introduce and relies on, he must introduce that . . . proof, or else suffer the presumption that, if the more satisfactory evidence had been given, it would have been detrimental to him and would have laid open deficiencies in, and objections to, his case, which the more obscure and uncertain evidence did not disclose.

Id. (quoting Masonite Corp. v. Hill, 154 So. 2d 295, 298 (Miss. 1934)).

34. *See, e.g.*, Celotex Corp. v. Catrett, 477 U.S. 317, 322–26 (1986) (examining the use of summary judgment to pass on the admissibility of an expert's testimony); United States v. Downing, 753 F.2d 1224, 1242 (3d Cir. 1985) (using motions in limine to exclude expert testimony); *"Agent Orange"*, 597 F. Supp. at 800 (discussing the statute of limitations and discovery rules when used to time bar claims); Potter v. Firestone Tire & Rubber Co., 863 P.2d 795, 820 (Cal. 1993) (examining failure to state a claim when dealing with emotional harm after exposure that is not accompanied by physical injury); *Elam*, 765 S.W.2d at 188 (directing and overturning jury verdicts).

35. The discovery rule requires that the statute of limitations begins to accrue on the date that the plaintiff knew or should have known of the cause of action. In addition, some jurisdictions also require that the plaintiff have constructive knowledge of the causal link to the defendant before the statute of limitations will accrue. *See* Raymond v. Eli Lilly & Co., 371 A.2d 170, 174 (N.H. 1977).

The controversy is magnified by the ideological clash between negative paternalism and populace utilitarianism.[36] For example, a defendant may present the argument that a plaintiff need not see a physician and receive a diagnosis before the statute of limitations begins to run. The defendant will state that this over protection results in negative paternalism because it undercuts an individual's control and knowledge over his person and his bodily functions. Thus, a defendant will urge that the discovery rule should not be interpreted according to a litmus test rule that knowledge exists only after medical confirmation of an injury. On the other hand, populace utilitarianism suggests that the good of the many is achieved by not requiring a race to litigation with less than sufficient proof of the existence of a disease or injury. Thus, the statute of limitations should not begin to run until the lay person receives credible information from a medical professional that a disease or injury is present. The tension between the statute of limitations and the discovery rule is obvious. Defendants are aided by the application of the statute of limitations,

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> One might read several discovery rule cases and conclude that the courts are applying two substantively distinct rules. In most cases the courts frame the rule in terms of the plaintiff's discovery of the causal relationship between his injury and the defendant's conduct. In some cases . . . a court will state simply that, under the discovery rule, a cause of action accrues when the plaintiff discovers or should have discovered his injury. Still other courts use both statements of the rule within the same case. The reason for these apparent differences is that in most cases in which the court states the rule in terms of the discovery of the injury, the injury is the kind that puts the plaintiff on notice that his rights have been violated. . . . In a case . . . in which the injury and the discovery of the causal relationship do not occur simultaneously, it is important to articulate exactly what the discovery rule means. . . . [T]he proper formulation of the rule and the one that will cause the least confusion is the one adopted by the majority of the courts: A cause of action will not accrue under the discovery rule until the plaintiff discovers or in the exercise of reasonable diligence should have discovered not only that he has been injured but also that his injury may have been caused by the defendant's conduct.

Id.

36. The phrase "negative paternalism" refers to the concept that a class of individuals can receive rights protection in spite of any ambivalence to take affirmative steps to protect their rights, while another opposing class of individuals must defend against the law's proxy protection of such rights. *See* JOHN KLEINIG, PATERNALISM 13 (1984). The phrase "populace utilitarianism" refers to the concept that a community advancing a democratically conceived social contract will benefit on the whole by adherence to rules designed to protect the entire community. *See* Liam Murphy, *Beneficence, Law, and Liberty: The Case of Required Rescue*, 89 GEO. L.J. 605 (2001) (defining utilitarianism as "a normative theory that explains all of morality and political justice in terms of positive obligation—the single positive obligation to benefit people as much as possible"). *See generally* JOHN STUART MILL, UTILITARIANISM (George Sher ed., Hackett Pub. Co. 1979) (1861).

while plaintiffs are aided by the application of the discovery rule. This tension defines an important procedural concern in proving factual causation.

In addition to substantive and procedural issues, there exists external concerns that impact a plaintiff's ability to prove factual causation in toxic tort litigation. One external problem is the existence of background risks that may cause a harm similar to the type of harm that could also be caused by exposure to a toxic substance. Scientific proof must isolate, or at the very least, account for background risks before plaintiffs can affirmatively state, with sufficient mathematical probability, that a toxic exposure is causally related to or associated with a disease or injury. The persistent reality is that populations in industrialized communities are exposed to multiple natural, as well as artificial, byproducts that may affect individuals as readily as any exposure to a toxic substance. To account for this reality, the law of toxic torts invariably must consider the impact of background risks of exposure that will result from mere existence in such a community.[37] In addi-

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37. Epidemiologists refer to background risks as confounding variables or confounders.

> [V]ariables . . . known to be related to, associated with, or that can influence the state of the subjects being studied are confounding variables. Confounding variables can affect controls and may lead to biased or misguided association between disease and cause, the agent or risk factors. Any characteristic, trait, or other factor that can distort or slant the results of a study can be a confounding variable if not taken into account or considered. Some of the more important variables that can be confounding to cases or controls are age, sex, race, occupation, education, [and] socioeconomic status. Any factor that distorts the outcome or effect of a study confounds the facts and objectivity of the results. Any factor that causes unequal distribution among the exposed and unexposed (cases and controls) can also distort or confound the outcome of the study.

TIMMERECK, *supra* note 23, at 240. For example, cigarette smoking is a common confounder or background risk.

> [C]onsider a study to determine whether alcohol drinkers experience a greater incidence of oral cancer than teetotalers. Smoking is an extraneous factor that is related to the disease (smoking has an effect on oral cancer incidence); it is also associated with alcohol drinking, since there are many people who are general 'abstainers,' refraining from alcohol consumption, smoking, and perhaps other habits. Consequently, alcohol drinkers include among them a greater proportion of smokers than would be found among nondrinkers. Since smoking increases the incidence of oral cancer, alcohol drinkers will have a greater incidence than nondrinkers quite apart from any influence of alcohol drinking itself but simply as a consequence of the greater amount of smoking among alcohol drinkers. Thus, the apparent effect of alcohol drinking is distorted by the effect of smoking; the two effects are intermixed in the single comparison of alcohol drinkers with nondrinkers. The de-

tion, the nature of the injury itself must be studied, isolated, and then categorized as the type of injury that can result from exposure to a particular toxic substance. Because of myriad substantive, procedural, and external concerns, factual causation remains a moving target for toxic exposure plaintiffs.

The purpose of this article is to expose the ontologically proof-based requirements for factual causation created by the judiciary and imposed against toxic exposure plaintiffs. Part II first explains the differences between factual causation in traditional tort cases and factual causation in toxic tort cases, then determines that the "but for" paradigm of traditional tort cases is an unrealistic burden to toxic exposure plaintiffs resulting in the dismissal of meritorious toxic tort claims. Part II also will analyze the various threshold requirements for establishing factual causation and compares these requirements to determine the test that best balances the interests between toxic exposure plaintiffs and defendants. Part III discusses the burdens of proof for factual causation and illustrates the tension between legal standards of admissibility and sufficiency and scientific standards of reliability and certainty. Part III also argues that the tension between law and science and the dangers of summarily dismissing meritorious toxic tort claims requires courts to consider that: (1) toxic tort defendants receive unfair advantages over toxic exposure plaintiffs in the current legal climate; (2) the judiciary has a responsibility to level the playing field between parties by establishing clear, defined, and fair procedural and substantive standards for admitting and weighing scientific evidence of factual causation; and (3) the judiciary must remain vigilant in propounding the corrective, distributive, compensatory, and deterrent purposes of the tort system. Finally, Part IV concludes that beyond scientific and medical certainties of proof of factual causation, philosophical and moral arguments exist which require the judiciary to recognize that toxic tort defendants should not be permitted to seek cover under varying yet stringent standards of proof for factual causa-

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gree of bias or distortion depends on the magnitude of the smoking effect as well as on the strength of association between alcohol and smoking. Either absence of a smoking effect on oral cancer incidence or absence of an association between smoking and alcohol would lead to no confounding. Smoking must be associated with both oral cancer and alcohol drinking for it to be a confounding factor.

KENNETH J. ROTHMAN, MODERN EPIDEMIOLOGY 90 (1986).

tion. As in any causal relationship, what is projected as a consequence is tested through experience.

The experience in an industrialized community is that toxic tort defendants profit from the use of toxins, and that such use, whether proved today or in years to come, will adversely impact the health of individuals. Social justice is a legitimate goal that can be achieved by fairly solving the controversies between toxic exposure plaintiffs and toxic tort defendants confronted with the issue of factual causation. Like traditional tort plaintiffs, toxic exposure plaintiffs should have an equal right to pursue social justice through litigation, and their efforts should not be thwarted by unrealistic standards of proof and admissibility. Courts may be informed by science and ontological ideology, but these same courts should not ignore epistemological ideology—that various consequences, including toxic harm, are experienced from exposure to toxins, and that those who profit from the use of the toxins shoulder a responsibility both philosophically and morally to those who are harmed.

II. THE CAUSATION ELEMENT IN TOXIC TORT LITIGATION

No issue is more difficult in environmental tort litigation than resolving the question of "whether the exposure to a toxic substance is the cause in fact of a plaintiff's harm."[38] Generally, causation has been explained and satisfied by demonstrating a nexus, a link, or some form of traceability between wrongful conduct and an injury.[39] The traditional common law "but for" test defines causation and, as applied, illustrates the "cause and effect" relationship between an event and a consequence.[40] The "but for" test assumes a linear and deductive connection between one event and the happening of another expected event.[41] Realizing that most events cannot be isolated to support the linear and de-

38. BOSTON & MADDEN, *supra* note 15, at 339.

39. *See* PROSSER AND KEETON ON TORTS, *supra* note 16, § 41, at 266. Taking a person out to sea is a cause of death of the person when he sinks without a trace immediately upon falling into the ocean, but failure to have a lifeboat ready is not a cause of the death. *Id.* at 265.

40. *See id.* at 266.

41. *See* D.S. Shwayder, *Causation and Causal Theories, Hume Was Right, Almost; and Where He Wasn't, Kant Was, in* 9 MIDWEST STUDIES IN PHILOSOPHY 141 (Peter A. French et al. eds., 1984) [hereinafter MIDWEST STUDIES IN PHILOSOPHY].

ductive connections between them, jurisprudence accounts for multiple catalytic events by measuring causation according to a "substantial factor" test.[42] The "substantial factor" test assumes that events may occur practically simultaneously to set in motion the happening of other resultant events.[43] Both of these tests are predicated on the assumption that events can be isolated, identified, and unquestionably associated with an expected event.

The fundamental underlying assumptions about causation were rarely questioned in traditional tort jurisprudence, and thus, resultant consequences or injuries that could not be explained within the context of either the "but for" or "substantial factor" tests would not be attributed to one or more actors responsible for the preceding events. The unexplained results or the unforeseeable consequences were handled under the judicially created rule of proximate or legal cause.[44] Proximate cause allowed judges to contract or extend the liability of an actor based upon an attempt to infuse public policy to achieve the tort goals of corrective justice, deterrence, or compensation.[45] This judicial method of ultimately determining liability is responsible for the many successes in the current tort system with respect to the protection of an individual's right to be free from mental or bodily harm resulting from the wrongful conduct of another.

Unquestionably, early toxic tort decisions, like *Borel v. Fibreboard Paper Products Corp.*,[46] recognized the importance of proximate cause principles and fair and balanced conclusions on liability in toxic tort cases. But the present trend in toxic tort litigation is to reduce the significance of the proximate cause principle and place more weight on stringent standards for factual cau-

42. Unlike the "but for" test, which accounts for only one cause and thus is regarded as a rule of exclusion, the "substantial factor" test accounts for the happening of multiple causes to bring about a consequence. *See* PROSSER AND KEETON ON TORTS, *supra* note 16, § 41, at 266. According to the "substantial factor" test, any one of the causes, operating alone, would be sufficient to cause the exact consequence. *Id.* at 267.

43. *Id.* at 468.

44. Proximate cause is far removed from factual causation in that its purpose is to measure the extent to which an actor should be legally responsible for the consequences of his act. At times, proximate cause may depend upon the significance or importance that an actor's conducts plays in bringing about a consequence. The test for proximate cause depends on the policy of the law and if that policy will extend the responsibility for the conduct to the consequences that result. *See id.* at 273.

45. *See id.* at 273–74.

46. 493 F.2d 1076 (5th Cir. 1973).

sation. The factual causation element in toxic tort litigation has eclipsed the public policy and social justice principles embedded in proximate causation. Abandoning proximate cause is tantamount to expressing that an ontological approach to finding factual causation is the only philosophical means to substantiate a "cause and effect" relationship in toxic tort cases.[47] Thus, commentators are correct that "no issue is more difficult in environmental tort litigation than resolving the question of whether the exposure to the toxic substance was the cause in fact of plaintiff's harm."[48]

A. *Proof of Factual Causation in Toxic Tort Litigation*

"The threshold requirement for establishing causation varies from jurisdiction to jurisdiction."[49] For example, in many jurisdictions the prevailing test for factual causation in traditional tort cases is the "but for" test. The "but for" test recognizes that a defendant's act is the cause in fact of the plaintiff's injuries if harm to the plaintiff would not have occurred in the absence of the defendant's conduct.[50] The "but for" test requires the plaintiff to show that non-negligent conduct by the defendant would have avoided harm to the plaintiff.[51] For example, if defendant negligently drives his car and rear ends plaintiff's car, plaintiff is jarred and hits her head on the steering wheel and is cut, defendant driver's conduct is considered a "but for" cause of the harm done to the plaintiff. The "but for" test has been used successfully in many tort cases, but the test accounts for the existence of only one cause. A negligent defendant can effectively argue that negligent conduct or non-negligent conduct from another source con-

47. *See Descriptive and Formal Ontology, available at http://www.formalontology.it/section_4.htm* (last modified Nov. 1, 2001). Ontology is the study of being. It is not reducible to pure cognitive analysis. In philosophical terms, it is not an epistemology or a theory of knowledge. Ontology represents the purely objective, while epistemology represents the theory of knowledge of the subjective side of reality. The two sides are obviously interdependent, but this is not to imply that they are the same, i.e., exactly like the head and tail of a coin. *See infra* note 78.

48. BOSTON & MADDEN, *supra* note 15, at 339.

49. L. Grant Foster, *A Case Study in Toxic Tort Causation: Scientific and Legal Standards Work Against Recovery for Victims*, 19 ENVTL. L. 141, 147 (1988).

50. *See* Christopher L. Callahan, *Establishment of Causation in Toxic Tort Litigation*, 23 ARIZ. ST. L.J. 605, 606 (1991).

51. *See* DAN B. DOBBS, THE LAW OF TORTS § 168, at 409 (2000).

tributed to plaintiff's harm and, therefore, liability cannot attach pursuant to the "but for" test. Thus, the "but for" test is viewed as unfair and unworkable in multiple cause tort scenarios, not just toxic tort litigation.

In order to remedy the inequity of a negligent defendant escaping liability because she is able to point to another cause for plaintiff's harm in addition to her own, tort law modified the "but for" test in multiple cause scenarios to the "substantial factor" test.[52] Under the "substantial factor" test, courts tend to take an epistemological approach to causation, which comports with legal policy that balances the equities between the multiple actors or causes and the injured plaintiff.[53] The "substantial factor" test allows a plaintiff to recover for her harm when two or more defendants engage in tortious conduct that injures her, when the conduct of either defendant standing alone could have caused the same harm.[54] The "substantial factor" test requires no reasoning beyond identifying preemptive causation;[55] instead, it invites the jury to exercise intuitive and experiential knowledge as opposed to reaching a conclusion based only upon legal certainty. The "substantial factor" test implicitly recognizes that fairness and justice cannot always be resolved with surgical precision. Because courts have taken an epistemological approach to traditional tort cases by recognizing the equity achieved by the "substantial factor" test, it would seem consistent to apply this same policy approach to resolve problems of multiple defendants or causes in toxic tort litigation.

Courts presiding over early toxic tort cases applied the epistemological approach to these complex controversies. Courts primarily relied on a mixture of epistemology and ontology when

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52. *Id.* § 171, at 415.

53. *See* Nancy Levit, *Ethereal Torts*, 61 GEO. WASH. L. REV. 136, 156 (1992) ("[I]n the past fifteen years, a few courts have permitted recovery for the increased risk of disease from exposure to toxic substances.") This was the case in *Petriello v. Kalman*, 576 A.2d 474, 484 (Conn. 1990) where the court allowed plaintiff to recover on a claim of increased risk of future harm only after plaintiff satisfied the substantial factor test for causation.

54. DOBBS, *supra* note 51, § 171, at 416.

55. Preemptive cause depicts a temporal disassociation between events, which protects a defendant from unlimited liability under the substantial factor test. For example, if defendant's conduct causes plaintiff's harm before the happening of another's negligent conduct that would characteristically bring about the same harm already suffered by plaintiff, the second actor's conduct is preempted because of the first defendant's conduct. *Id.*

presented with information in the form of scientific and medical evidence of factual causation. Courts were less likely to make conclusive determinations on the issue of factual causation and its establishment by probabilistic evidence. Conversely, courts were prone to view both probabilistic evidence and legal policy or intuition together to arrive at an equitable decision about the submission of the case to the trier of fact.[56] This observation does not mean that courts ignored scientific evidence based upon statistics; rather, it means that courts were unwilling to abandon epistemology altogether as a component of a fair and just result on the issue of factual causation. This hybrid philosophical (mixture of epistemology and ontology) approach to factual causation and scientific and medical expert testimony yielded a suitable foundation for fair treatment of litigants in early toxic tort cases.

The hybrid philosophical approach to factual causation in United States common law is best illustrated by *Borel*, one of the most notable toxic tort cases of the Twentieth Century. Mr. Borel was an industrial insulation worker from 1936 until 1969, the year he was diagnosed with the disabling disease called asbestosis.[57] His primary task was to install the insulation product, asbestos.[58] He performed this task without knowing the dangerous effects of asbestos on the human body.[59] Neither his employer nor the asbestos manufacturers told Mr. Borel or other asbestos installation workers about the adverse health effects of asbestos,[60] even though independent medical literature from private as well as government sources confirming these adverse effects was published and accepted in the medical and scientific communities.[61] The United States Court of Appeals for the Fifth Circuit affirmed the lower court's decision that asbestos manufacturers were responsible for Mr. Borel's injuries on the theory of product liability negligence,[62] more specifically, for failing to warn of the dangers involved with handling asbestos.[63] The Fifth Circuit reasoned that the asbestos manufacturers failed to provide Mr. Borel and

56. *See* Borel v. Fibreboard Paper Prod. Corp., 493 F.2d 1076, 1081 (5th Cir. 1973).
57. *Id.*
58. *Id.* at 1082.
59. *Id.*
60. *Id.*
61. *Id.* at 1083.
62. *Id.*
63. *Id.* at 1081.

other insulation workers with adequate warnings about the dangers of inhaling friable asbestos particles and the need to take precautions by wearing respirators while working with the insulation material.[64]

The Fifth Circuit and the trial court both examined factual causation using a hybrid philosophical approach. Specifically, the *Borel* court viewed medical literature from the 1950s and 1960s as well as government studies on the issue of factual causation.[65] The court looked to plaintiff's expert, Dr. Hans Weill,[66] who testified "that prior to 1935 there were literally 'dozens and dozens' of articles on asbestos and its effect on man."[67] The trial court was convinced that the test for factual causation was met in this case even after reviewing the testimony of an expert presented by the asbestos manufacturers.[68] Defendants' expert witness, Dr. Clark Cooper, stated, "it was known in the 1930s that inhaling asbestos dust caused asbestosis and that the danger could be controlled by maintaining a modest level of exposure."[69] Based on the testimony and the medical literature compiled by both plaintiff and defendants,[70] the Fifth Circuit agreed with the trial court that a question of fact on the issue of factual causation was ripe for the jury.[71] According to the context of the case, Doctors Weill and Cooper were not required to tailor their testimony to the duality test of factual causation or to standards of admissibility.[72] Rather, these experts gave their opinions about the causal link between exposure to asbestos, the levels of exposure, and plaintiff's injury.[73] Thus, relying on the hybrid philosophical approach, the trial court accepted the testimony of the experts presented by

64. *Id.* at 1098–99.

65. *Id.* at 1084–85.

66. The case does not expressly state that Dr. Weill is an expert for the plaintiff, but the statement that he was an expert can be inferred from the context of the discussion about expert witnesses. *See id.* at 1092.

67. *Id.*

68. *Id.* at 1093.

69. *Id.*

70. For a list of studies that were presented by both parties in support of or in opposition to the adverse effect of asbestos on the human body, see *Borel*, 493 F.2d at 1083 n.1, 1084 nn.3–11, 13.

71. *See Borel*, 493 F.2d at 1094.

72. *See infra* notes 292–316 and accompanying text.

73. *See Borel*, 493 F.2d at 1094.

both parties, but left the weighing of this testimony and the credibility of it to the trier of fact.[74]

The trial court's treatment of these experts as competent to express an opinion provides insight into the role of scientific and medical testimony in litigation. Furthermore, the trial court realized that the role of such expert testimony should not be curtailed by evidentiary mechanisms, which fail to account for the differences between scientific or medical expert opinions and the legal conclusions regarding the correctness of those opinions.

In addition to including the testimony of the experts based upon a hybrid philosophical approach to establishing factual causation, the *Borel* court applied this same approach to the substantive factual causation dilemma presented by the various defendants joined in the action.[75] Thus, it can be inferred that a problem with indeterminacy existed with regard to both the sources of the plaintiff's injury and the wrongful actor. The source, i.e., the exact asbestos particle inhaled by plaintiff, can be considered the physical cause[76] of plaintiff's injury, and the wrongful actor, i.e., the asbestos manufacturers who failed to provide adequate warnings, can be considered the efficient cause[77] of the plaintiff's injury. The Fifth Circuit realized that the plaintiff's injury could not have occurred without the combination of these two causes. Therefore, the court did not ponder the traceability formula that works well with simplistic factual cause and effect situations found in many traditional tort cases because that theory would work a serious injustice against Mr. Borel, whose case involved multiple tortfeasors. To affirm justice in this case, the Fifth Circuit applied the hybrid philosophical approach[78]

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74. *See id.*

75. The plaintiff's original complaint named the following manufacturers as defendants: Owens-Corning Fiberglass Corp.; Standard Asbestos Manufacturing and Insulating Co.; Unarco Industries, Inc.; Eagle-Picher Industries, Inc.; Combustion Engineering, Inc.; Fibreboard Paper Products Corp.; Johns-Manville Products Corp.; Pittsburgh Corning Corp.; Phillip Carey Corp.; Armstrong Cork Corp.; and Ruberoid Corp. *See id.* at 1086, n.17.

76. The physical cause may be described as the necessary cause or the *sine qua non*, without which the injury cannot occur.

77. The efficient cause represents the external force acting on the physical cause to produce change.

78. *See* MIDWEST STUDIES IN PHILOSOPHY, *supra* note 41, at 135. According to modern empiricism, the status of the causation category concerns solely our experience and knowledge of things, without being a trait of the things themselves. Thus, the epistemological view of causation refers to conceptual events regardless of the relationship of these events

to support its conclusion that the trial court and the sitting jury could reasonably have concluded that Mr. Borel proved the factual causation element.[79] Based upon experience and perception, these judges agreed that:

> Borel contracted asbestosis from inhaling asbestos dust. . . . [H]e was exposed to the products of all the defendants on many occasions. . . . [T]he effect of exposure to asbestos dust is cumulative, that is, each exposure may result in an additional and separate injury. [Thus,] on the basis of strong circumstantial evidence the jury could find that each defendant was the cause in fact of some injury to Borel.[80]

This unencumbered epistemological approach to finding that a genuine issue of material fact existed, for which the jury is the decision-maker, is on an unfortunate decline in toxic tort jurisprudence. Generally, in current toxic tort litigation, many courts require scientific and medical experts to prove factual causation in accordance with a purely ontological approach, which, in effect, leaves no room for the trier of fact to apply experiential knowledge to the calculus to find factual causation.

Unlike today's cases, the *Borel* court treated the experts' opinions as a matter of credibility and, thus, the court did not seek to exclude scientific and medical testimony as inadmissible. Through its opinion, the court expressed that the jury was capable of weighing both scientific and medical testimony to arrive at a fair and just verdict.[81] In addition, the court relied on the traditional principle of proximate cause to set the extent to which the

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to reality. In this context, causation is determined by the relationship between an event and its related, perceived, or previously experienced outcome. The recognized combination of the epistemological and ontological views of factual causation in traditional tort cases is an accepted philosophy because courts dealing with traditional tort cases retain a sense of certainty about potential outcomes in these cases. Alternatively, this very same view seems absent or eroded in the analysis of toxic tort cases and issues of factual causation. In toxic tort cases, courts are attempting to apply a purely ontological view to factual causal determinations, where factual causation issues are inherently uncertain. The courts apply this view to erect the same degrees of certainty to which they are accustomed to seeing in traditional tort cases. The application of pure ontological theory fails because it does not account for the natural undercurrent of related experience that is a necessary component to evaluate real or fact-based events. *See generally* BUNGE, *supra* note 6.

79. *See Borel*, 493 F.2d at 1094.

80. *See id.*

81. *See id.* at 1092–94; *cf.* Aguilar v. Citgo Ref. & Chem. Co., [Nov. 25, 1998] 13 Toxic L. Rep. (BNA) 809 (S.D. Tex. Nov. 3, 1998) (deciding that plaintiffs presented sufficient evidence to send the case to the jury, even without expert testimony. The judge placed the responsibility of weighing the evidence squarely on the jury. The jury then returned a verdict for defendant.).

defendants would be liable for the injuries caused by their conduct.[82] On the issue of proximate causation, the Fifth Circuit relied on the foreseeability test to analyze what the defendants knew or should have known about the dangers that exposure to asbestos posed.[83] Based on the existing medical literature and the defendants' status as an expert,[84] the Fifth Circuit agreed with the district court that the dangers of inhaling asbestos were foreseeable because the accepted medical literature documented that each exposure to asbestos could result in cumulative injury to the inhaler.[85] The court's focus was on properly limiting defendants' liability to ensure a fair resolution between the wrongdoer and the injured party. The court did not seek to insulate defendants from responsibility by placing additional obstacles in front of the plaintiff on the issue of factual causation.[86] Instead, the court used the tried and tested legal doctrines of proximate cause and foreseeability to balance the equities between the asbestos manufacturers and Mr. Borel.[87] The current trend in toxic tort cases, however, is to erect substantive and procedural obstacles, for example, a dual factual causation test and stringent admissibility standards. Courts are erecting these obstacles without regard to the inherent differences between scientists and treating physicians and disregarding the need for balancing the equities that the Fifth Circuit achieved in *Borel*.[88]

Unlike Mr. Borel and other plaintiffs in traditional tort cases, many toxic exposure plaintiffs must now meet an additional substantive requirement for establishing factual causation. This new

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82. *See Borel*, 493 F.2d at 1093.

83. *Id.*

84. The Fifth Circuit concluded that defendants were experts because they were in the business of researching, testing, manufacturing, and marketing asbestos. *See id.* at 1089–90.

85. *Id.* at 1092.

86. For example, the court did require that factual causation could only be established by expert testimony.

87. *See Borel*, 493 F.2d at 1093.

88. *See generally* Margaret A. Berger, *Eliminating General Causation: Notes Toward a New Theory of Justice and Toxic Torts*, 97 COLUM. L. REV. 2117 (1997) (espousing the principles of achieving greater justice and combining theory with pragmatism require the substantive law governing toxic torts to be recast by abolishing proof of the general causation prong of factual causation as the crucial factor that controls liability). Professor Berger states that the current "causation model is blind to the realities of scientific uncertainty and corporate behavior, and is inconsistent with notions of moral responsibility underlying tort law." *Id.* at 2117.

requirement is scientific and medical expert testimony.[89] But proffering expert testimony is not a guarantee of winning a toxic tort case, nor is it even a guarantee for surviving a motion for summary judgment requested by a defendant who is armed with an equal number of experts.[90] This new substantive requirement renders any reliance on epistemological or hybrid philosophical approaches to factual causation pernicious.

In stark contrast to the hybrid philosophical approach and the outcome in *Borel*, courts deciding recent toxic tort cases exhibit over-reliance on the purely ontological approach to cause and effect, which is impenetrably nested in linearity or traceability theories. Illustrative of this approach to causation is *Koehn v. Ayres*.[91] In *Koehn*, plaintiffs were subsequent purchasers of land that previously had been subject to an oil, gas, and mineral lease owned by Texaco Exploration and Production Company and later by North Central Oil Company.[92] Under the lease, Texaco was permitted to place a saltwater disposal pit on the land.[93] The pit was used for the disposal of saltwater from 1936 to the late 1960s.[94] The plaintiffs alleged that the pit was used for the disposal of unauthorized hazardous oil field wastes.[95] Among other harms, plaintiffs alleged personal injuries resulting from expo-

89. Expert testimony is indispensable to the preparation and execution of a toxic tort case. *See* Stubbs v. City of Rochester, 124 N.E. 137, 140 (N.Y. 1919) (relying on expert testimony of a bacteriologist of the City of Rochester who analyzed samples of water from the City's water supply and discovered the existence of bacteria that could cause typhoid fever). In *Stubbs*, defendant's experts testified that other possible causes apart from water could have caused the cases of typhoid reported in the area. *Id.*

90. Professor Erica Beecher-Monas notes that, under the *Frye* test for admissibility of expert testimony, for nearly seventy years courts have relied on the general acceptance standard that involved determining whether the expert's conclusions had achieved consensus in the expert's field. *See* Erica Beecher-Monas & Edgar Garcia-Rill, *The Law and the Brain: Judging Scientific Evidence of Intent*, 1 J. APP. PRAC. & PROCESS 243, 244–45 (1999). She states that after the United States Supreme Court's decision in *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579 (1993), "difficult as it may be . . . requiring judges to evaluate the validity of proffered evidence is a vast improvement over merely counting scientific noses to determine admissibility." Beecher-Monas & Garcia-Rill, *supra*, at 244–45.

91. 26 F. Supp. 2d 953 (S.D. Tex. 1998).

92. The defendant, Ayres, had received the property, subject to the oil, gas, and mineral lease. *Id.* at 954.

93. *Id.* at 955.

94. *Id.*

95. *Id.*

sure to hazardous substances that leaked from the saltwater pit into the groundwater under the property.[96]

In response, defendants moved for summary judgment, claiming that plaintiffs could not "prove either that they were exposed to any hazardous substance in the saltwater disposal pit or that their alleged personal injuries were medically caused by exposure to any substance in the pit."[97] On the latter issue, plaintiffs submitted reports from two experts, both of whom made generalized statements about the link between some toxins alleged to be in the pit and various illnesses complained of by plaintiffs.[98] The court determined that the reports made by the two experts did not create a genuine issue of material fact for the jury.[99] This determination was premised on the court's observation that plaintiffs' experts did not conduct examinations, consider plaintiffs' medical histories, or "offer any substantiated conclusions about the medical probability that these plaintiffs' injuries were caused in whole or in part by exposure to environmental toxins."[100] The court held that a plaintiff, as a matter of law, fails to establish a causal link between toxic exposure and injury when the plaintiff does not present an "opinion from at least one [expert who testifies to] a reasonable medical probability" about the causal nexus between the events.[101] This holding is significant because it signals the existence of an additional substantive requirement to proffer scientific and medical testimony on issues of factual causation in order to survive a motion for summary judgment.[102] This

96. *Id.*

97. *Id.*

98. *Id.* at 956.

99. *Id.* For a discussion of legal sufficiency, see *infra* Part III.

100. *Koehn*, 26 F. Supp. 2d at 956.

101. *Id.*

102. Plaintiffs can easily find themselves unable to procure expert scientific testimony regarding a positive link between exposure and injury because many agents are not the subject of epidemiological studies. This is true, not because the agent is not worth studying, but rather because these studies are expensive or such exposure has never occurred or been observed prior to litigation. *See* Erica Beecher-Monas, *A Ray of Light for Judges Blinded by Science: Triers of Science and Intellectual Due Process*, 33 GA. L. REV. 1047, 1090–92 (1999).

> [R]equiring that all the information gaps be filled in order to go forward is not only a scientific impossibility, but it also places a perverse disincentive on manufacturers' investment in safety testing. Because any information gained from research may be used against the manufacturer in litigation, a minimum of evidence is produced. Neither industry nor government adequately funds research on potentially toxic substances. No toxicity data exist for

decision presents courts with a new path to dispose of toxic tort claims in the nascent stages of litigation. Under the *Koehn* standard, a plaintiff unable to proffer expert testimony at the motions phase will be ejected from court with prejudice. The question remains whether a majority of the courts will venture down this path.[103]

Similarly, in *Herrington v. Leaf River Forest Products, Inc.*,[104] the Mississippi Supreme Court affirmed the trial court's grant of summary judgment citing a lack of sufficient evidence to create a

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> nearly eighty percent of the chemicals in use. There simply is no incentive for manufacturers to produce evidence that may eventually be used against them in court.

Id. at 1090–91.

103. *See, e.g.*, Aguilar v. Citgo Ref. & Chem. Co., [Nov. 25, 1998] 13 Toxics L. Rep. (BNA) 809 (S.D. Tex. Nov. 3, 1998). The trial court in the same district as *Koehn* refused to require plaintiffs to present expert testimony in order to survive a motion for summary judgment. *Id.* at 810. The plaintiffs worked in defendant's refinery in Corpus Christi, Texas, when an explosion occurred during the workday. *Id.* The explosion caused a release of hydrogen fluoride at the plant. *Id.* Several plaintiffs claimed exposure to the toxic substance. *Id.* The injuries complained of by plaintiffs included respiratory and gastrointestinal ailments. *Id.* The plaintiffs, however, could not present a medical or scientific expert to provide testimony of a positive link between their injuries and their exposure to the defendant's release of hydrogen fluoride. *Id.* As such, the plaintiffs decided to present lay evidence of exposure by offering testimony about the fire, the explosion, and the adverse health ailments each plaintiff suffered from shortly after the catastrophe. *Id.*

The judge determined that the lay testimony was sufficient to establish a prima facie case on the issue of causation and gave the case to the jury. *Id.* The defendant presented expert evidence to the jury that undermined plaintiffs' assertions that their injuries were caused by release of hydrogen fluoride after the explosion. *Id.* Defendant's experts testified that the release of hydrogen fluoride after the explosion was insufficient to cause the adverse health effects alleged, because the vegetation surrounding the defendant's facility showed no damage. *Id.* The defendant's experts persuaded the jury that the release of the hydrogen fluoride was not the cause of the plaintiffs' injuries. *Id.*

Both parties relied upon observation-based theories to present their respective versions of the case, but the jury was most persuaded by the defendant's medical and scientific experts whose epistemological opinions were cloaked in ontological cloth. *Id.* Defendant's experts provided the following theory: because vegetation surrounding the plant remained unharmed, then humans could not be harmed by the same exposure. *Id.* The jury's verdict fails to account for the exposure witnessed by plaintiffs, and the observation of the injuries that ensued shortly after exposure. *Id.*

One positive result from *Aguilar* is the trial judge's decision to refrain from unbalanced judicial activism in applying standards of legal sufficiency and prematurely disposing of claims asserting injury from toxic exposures. *Aguilar* does not represent the trend of unbalanced judicial activism in the areas of admissibility of expert testimony and the de facto requirement for expert witnesses to hurdle virtually insurmountable standards for legal sufficiency in toxic tort litigation. *Aguilar* is an atypical legal sufficiency case in toxic tort litigation because it represents a departure from the mainstream cases that require toxic tort plaintiffs to satisfy rigorous standards which routinely eclipse the attainable requirement of presenting a genuine issue of material fact.

104. 733 So. 2d 774 (Miss. 1999).

question of fact for the jury.[105] The Mississippi Supreme Court held that the plaintiff's medical or scientific evidence did not meet the standard for legal sufficiency because the evidence was based upon general observations.[106] The plaintiff contended that "circumstantial evidence is sufficient to establish causation. Circumstantial evidence consists of evidence of a fact, or a set of facts, from which the existence of another fact may reasonably be inferred."[107] The plaintiff presented the following unrebutted evidence: she lived downstream of defendant's company; she contracted Hodgkin's disease after defendant released dioxin into the waters that carried fish subsequently caught and eaten by plaintiff over a period of six years; scientific testimony that defendant placed dioxin in the water; and medical testimony based upon dioxin contamination literature.[108] Using this circumstantial evidence, plaintiff asserted that she developed her disease after her exposure to the fish and the water from the Leaf River.[109] The court concluded that observation and inference were no longer persuasive in the determination of legal sufficiency.[110] The court reasoned that medical and scientific evidence and opinion are required to establish a question of fact on the factual causation element,[111] ignoring the hybrid philosophical approach in the analysis of factual causation.

Koehn and *Herrington* represent the general trend in toxic tort

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105. *Id.* at 779–80. ("[W]e must address the burden of proof required to withstand summary judgment when the theory of recovery [in a contamination action] is negligence and the damages asserted are physical injuries."). *Id.* at 777.

106. *Id.* at 779.

107. *Id.* at 777 (internal citations omitted).

108. *Id.* at 776, 778.

109. *Id.* at 776.

110. *Id.* at 779; *see* David M. Benjamin, *Elements of Causation in Toxic Tort Litigation*, 14 J. LEGAL MED. 153, 160–61 (1993). Benjamin summarizes an article in Trial News and states that

> the judiciary has already abandoned its traditional role and, spurred on by a glut of complicated toxic tort cases, embarked on a type of "judicial activism" that has involved the "aggressive use of summary judgment," a "growing refusal of federal trial and appellate courts to honor jury verdicts' for plaintiffs, an 'increasing willingness of the federal courts to develop and apply substantive rules of law in derogation of state rules more favorable to the victim,'" and "the use of the federal constitution to invalidate state law principles thought to be unfair or damaging to manufacturers."

See id.

111. *Herrington*, 733 So. 2d at 779 (holding that the plaintiff "had no medical or scientific evidence that her diseases were caused by dioxins or other chemicals of the kind discharged by [defendants]").

decisions that conclude, as a matter of law, that plaintiffs do not satisfy the standard for legal sufficiency when they proffer evidence that tends to rely on observation and perception of related events to establish factual causation.[112] As such, these courts, in a sweep of unbalanced judicial activism, close the doors to epistemology as a means to measure factual causation as well as to legitimate opportunities for toxic tort plaintiffs to satisfy the increased proof requirements of factual causation.

B. *Judicial Treatment of Factual Causation in Toxic Tort Litigation*

Generally, there are three tests courts rely on to evaluate factual causation in toxic tort cases. Legal sufficiency standards are keenly relevant in the evaluation of factual causation because the standard dictates the kind and amount of evidence that a plaintiff must proffer to survive the motion phases of toxic tort cases.[113] Toxic exposure claims are usually disposed of at the summary judgment stage for lack of sufficient evidence to support a finding that a genuine issue of material fact exists to warrant submission of the case to a jury.[114] Plaintiffs stand a better chance of meeting legal sufficiency standards if they know which factual causation

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112. *See* Koehn v. Ayres, 26 F. Supp. 2d 953, 957 (S.D. Tex. 1998); *Herrington*, 733 So. 2d at 779.

113. Legal sufficiency is an elusive standard. It is safe to conclude that the standard for legal sufficiency varies from case to case, and its satisfaction depends, in part, on the penchant of a court to require a plaintiff to meet relaxed or rigorous standards. *See* discussion *infra* Part III.

114. *See* Celotex Corp. v. Catrett, 477 U.S. 317, 322 (1986) (stating that "summary judgment is proper 'if the pleadings, depositions, answers to interrogatories, and admissions on file, together with the affidavits, if any, show that there is no genuine issue as to any material fact and that the moving party is entitled to a judgment as a matter of law'" (citations omitted)). In *Celotex*, the Supreme Court relied on plain language to analyze Federal Rule of Civil Procedure 56(c). *Id.* The Supreme Court stated, "[the rule] mandates the entry of summary judgment, after adequate time for discovery and upon motion against a party who fails to make a showing sufficient to establish the existence of an element essential to that party's case, and on which that party will bear the burden of proof at trial." *Id.* The Court further stated:

> there can be "no genuine issue as to any material fact," since a complete failure of proof concerning an essential element of the nonmoving party's case necessarily renders all other facts immaterial. The moving party is "entitled to a judgment as a matter of law" because the nonmoving party has failed to make a sufficient showing on an essential element of her case with respect to which she has the burden of proof.

Id. at 323.

tests are followed in various jurisdictions. While not exhaustive, the general-specific causation test, the general-specific causation plus test, and the frequency-regularity-proximity test are representative of those that courts employ to resolve factual causation issues in toxic tort litigation.

1. General-Specific Causation

The general-specific test is a two-pronged analysis that requires a plaintiff to show that the toxic substance to which she was exposed was capable of causing the kind of injury that she manifests.[115] To satisfy the general-specific causation test, the plaintiff must then demonstrate that the harm she suffered was of the same type of injury that results from exposure to the toxic substance.[116]

An application of this test can be seen in *Earl v. Cryovac.*[117] *Earl* is a typical case representing the two-pronged approach to establishing factual causation in toxic exposure cases. James Earl worked as a meat packer[118] and "alleged that his lungs were [damaged at work after] he was exposed . . . to vapors emitted from a plastic film manufactured by [defendant]."[119] In support of his theory, plaintiff presented the testimony of three experts: plaintiff's treating physician, an industrial hygienist, and a research professor with substantial experience in chemical technol-

115. *See* Daniel A. Farber, *Toxic Causation*, 71 MINN. L. REV. 1219, 1227 (1987) (describing the general causation prong as the first causation problem). Professor Farber explains that plaintiffs have to establish that "the chemical involved is capable of causing the type of harm from which the plaintiff suffers." *Id.* Farber opines that "medical theory is relatively unhelpful in filling gaps in the factual picture . . . [because] [m]any toxic substances are relatively novel . . . [such that] sufficient evidence concerning health effects is not likely to be available for the foreseeable future." *Id.* at 1227–28.

116. *Id.* In the same article, Professor Farber describes the specific causation prong as the second causation problem. He states, "the other problem relating to proof of causation is that of establishing that, given that the toxic substance in question can cause harm of the type suffered by the plaintiff, the plaintiff's harm did in fact result from such exposure. *Id.* at 1228.

117. 772 P.2d 725 (Idaho Ct. App. 1984). Cryovac is a division of the infamous W.R. Grace Co., a firm that found itself entangled in the Woburn water contamination case where plaintiffs alleged that their children and other family members developed leukemia and other illnesses after ingesting, inhaling, and absorbing well water allegedly contaminated by, among others, another Grace subsidiary. *See generally* JONATHAN HARR, A CIVIL ACTION (1996) (describing the litigation of the Woburn contamination case).

118. *Earl*, 772 P.2d at 729.

119. *Id.* at 726.

ogy.[120] All three experts corroborated and supported plaintiff's theory that the plastic used in the meat packing process, when heated to boiling temperatures in a low temperature room, created a fog and vapors that were harmful when inhaled.[121]

The trial court "held that the plaintiff . . . failed to establish a genuine issue of material fact regarding [factual] causation."[122] To reach this decision, the trial court implicitly concluded that reasonable minds could not differ "as to the material facts or the inferences to be drawn from those facts."[123] The general causation prong required a showing that the toxic substance had the potential to cause a type of harm alleged by the plaintiff,[124] which, in this case, was lung disease.[125]

While plaintiff's treating physician had no significant knowledge of lung diseases resulting from heated plastic, he inductively began his search for the cause of plaintiff's ailment by reviewing and listening to observations made by the plaintiff.[126] These observations included noticing that plaintiff's ailment subsided when he was away from work for extended periods of time.[127] From this information, the treating physician narrowed his search for a cause to plaintiff's place of employment, where he discovered the operation of the meat-wrapping machine.[128]

The machine's function was to boil plastic in water.[129] The combination of the high boiling temperature and the low temperature of the room produced a vapor or fog that contained chemical particles, which were later determined, with high probability, to be harmful if inhaled.[130] In his search, the treating physician also discovered "medical literature documenting the existence of 'meatwrapper's asthma' or 'meatwrapper's syndrome,' a chronic lung disease observed in employees of meatpacking plants and

120. *Id.* at 728–31.
121. *Id.*
122. *Id.* at 731.
123. *Id.* at 731–32.
124. *See* Farber, *supra* note 115, at 1227.
125. *Earl*, 772 P.2d at 726.
126. *Id.* at 729.
127. *Id.*
128. *Id.*
129. *Id.*
130. *Id.* at 729–31.

butcher shops where plastic bags were cut by a thermal process known as a 'hot wire.'"[131]

In concluding that the trial court erroneously granted defendant's motion for summary judgment, the appellate court determined that plaintiff had established the general causation prong of factual causation.[132] Plaintiff's expert showed that the medical literature attributed meat packer's disease to the release of vapors during the heating of plastic materials used in meat packing processes.[133]

The second prong of factual causation requires a showing of specific or particularized causation.[134] Under this prong, the plaintiff must demonstrate the toxic potential of the substance, his exposure to the toxic substance, and his particular harm arising from exposure.[135] The specific causation prong carries a substantial burden of production, especially if a court misinterprets the weight that should be placed on the testimony of a treating physician.[136] *Earl* represents an equitable balance that can be struck under the specific causation prong.[137] In fact, if viewed

131. *Id.* at 729.

132. *Id.* at 731–32.

133. *Id.* General causation in toxic exposure cases is usually established by presenting scientific evidence of probabilistic causation. Beecher-Monas, *supra* note 102, at 1094–99. Frequently, epidemiologists or toxicologists are employed to render an opinion about the association between a toxin and a disease. *Id.* at 1099. However, "[i]t is important to remember that association of agent and disease does not prove causation .... The results of scientific studies can only tell how frequently exposure would be associated with disease as a matter of chance. Probabilities help to decide whether an association between two variables exists." *See id.* at 1094–95.

134. *See* Joseph Sanders, *From Science to Evidence: The Testimony on Causation in the Bendectin Cases*, 46 STAN. L. REV. 1, 14 (1993) ("Specific causation asks whether exposure to a substance caused a particular plaintiff's injury.").

135. "In a toxic tort case, the cause in fact is a manifold proof: (1) an exposure to an identified harmful substance significant enough to activate disease [specific]; ... (3) diagnosis of such disease in the plaintiff [specific]; (4) expert opinion that the disease in plaintiff is consistent with exposure to the harmful substance [specific]." Elam v. Alcolac, Inc., 765 S.W.2d 42, 178 (Mo. Ct. App. 1988) (citing G. Marc Whitehead & Larry D. Espel, *Legal Proof of Causation in Toxic Tort Litigation*, 2 TOXIC L. REP. (BNA) 1040 (1988); MICHAEL DORE, LAW OF TOXIC TORTS § 24.03 (1987)).

136. A treating physician usually must testify to a reasonable medical certainty before his opinion will be admitted into evidence. The standard for reasonable medical certainty is discussed in Part III. Prior to admission, the judge determines the qualifications of the expert witness to testify as well as measures the reliability of the expert's methodology that supports her opinion. If the physician passes the judicial gatekeeper, her medical opinion should be added to plaintiff's quantum of evidence. The judge should then review plaintiff's entire body of evidence to determine if the standard for legal sufficiency is met.

137. *Earl*, 772 P.2d at 727.

properly, the court, when deciding on the existence of a genuine issue of material fact, should consider that a treating physician's opinion about the causal relationship between exposure and injury is not discredited merely because his opinion is not documented in scientific literature.[138]

Thus, for specific causation, the standard of reasonable medical certainty must be viewed differently, for purposes of legal sufficiency, than its counterpart in general causation and the standard for legal certainty.[139] In the latter, scientists study populations, associations between exposure and disease, and statistical probabilities, while in the former, physicians rely on the case method to accomplish a medical treatment objective, which is to cure or prevent harm to a patient.[140] For example, the *Earl* court found the treating physician's testimony about the worsening of his patient's symptoms and physical condition while at work versus his patient's improved physical condition away from work compelling specific causation evidence that was consistent with the general causation evidence proffered by previous scientific expert witnesses.[141] The plaintiff demonstrated a similarity between his lung disease and the documented diseases in the medical literature.[142] The *Earl* court weighed the quantum of scientific and medical evidence to support its conclusion that a genuine is-

138. *Id.* at 727–28. Professor Beecher-Monas explains that:

> no matter how persuasive epidemiological or toxicological studies may be, they do not show individual, specific causation although they might enable a probabilistic judgment about the association between a particular chemical exposure and human disease on a population level. This clarifies an important consideration underlying any scientific evidence: attributing causation for a particular individual is not a scientific but a legal finding.

Beecher-Monas, *supra* note 102, at 1098–99.

This author disagrees with the latter conclusion presented by Professor Beecher-Monas, only to the extent that it may imply that a medical professional cannot provide testimonial evidence of differential diagnoses, which point to legitimate, potential causes of plaintiff's injuries. However, the ultimate point of her statement elucidates that uncertainty remains regarding specific causation even after probabilistic evidence of association is admitted. Professor Beecher-Monas concludes: "[e]ven if epidemiologists and toxicologists are able to identify correlations between exposure to a given chemical and a disease, their summary statistical statements apply only to the group studied, not to the individual members of the group." *Id.* at 1099.

139. *See id.* at 1102–03.

140. *Id.*

141. *Earl*, 772 P.2d at 733.

142. *Id.*

sue of material fact was established for the factual causation element.[143]

Unfortunately, many courts presiding over toxic tort cases do not treat scientific and medical evidence in a cumulative fashion on the issue of factual causation.[144] Instead, these courts require scientists and medical professionals, separately and individually, to link, with unreasonably heightened certainty, an agent to a disease, and specifically to plaintiff's disease.[145] The *Earl* court properly viewed the scientific and medical evidence as cumulative and symbiotic when deciding that a genuine issue of material fact existed because scientists themselves base their opinions on multiple confirmatory studies in different disciplines, not just on one study.[146] The *Earl* court's decision to allow the case to move forward is indicative of the balanced application of the hybrid philosophical approach within the general-specific causation test.

2. General-Specific Causation Plus

This test closely approximates the first test. In addition to the proofs required in the first test, however, this test can alter the type and amount of proof that would normally be considered adequate under the general-specific causation test.[147] The plus test equates the specific causation prong of the factual causation element in toxic tort cases with the epidemiological term, causality assessment.[148] This causality assessment is derived from the application of the Bradford Hill factors, a "set of criteria widely used by epidemiologists in studying" the causal relationship between exposure to toxins and disease.[149] These factors include: (1) the

143. *Id.* at 732–34.

144. *See, e.g.*, Merrell Dow Pharm., Inc. v. Havner, 953 S.W.2d 706 (Tex. 1997).

145. *Id.*

146. *See Earl*, 772 P.2d at 732–34; Beecher-Monas, *supra* note 102, at 1096.

147. *See Havner*, 953 S.W.2d at 714–15.

148. *See* TIMMRECK, *supra* note 23, at 334.

149. *Havner*, 953 S.W.2d at 718. In addition to showing general causation, expert testimony of an association between an agent and a disease along with proof that the association is statistically significant, a plaintiff, under the general-specific causation plus test, must also make a causality assessment. A causality assessment has two elements, necessary and sufficient. The necessary element "refers to the idea that a certain [toxin or agent] must always be present and precede an effect [or disease]." TIMMERECK, *supra* note 23, at 334. The disease or effect can be the result of one or many existing toxins or agents. The sufficient element refers to the idea that a certain toxin or agent inevitably produces

strength of association;[150] (2) consistency;[151] (3) specificity;[152] (4) temporality;[153] (5) biological gradient;[154] (6) plausibility;[155] (7) congruence;[156] (8) experiment;[157] and (9) analogy.[158] If the plaintiff

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an effect or disease or at least initiates the effect or disease. *Id.* A toxin or agent has to be present in sufficient amount to cause a disease or effect. The causality assessment requires plaintiff's experts to observe the variables or occurrences not actively changed by the epidemiologists as well as the variables or occurrences that are changed for the purpose of the study. *See id.* The trouble with judicial reliance on causality assessments is the invariable disagreement in the scientific community about which factors are useful to rendering a causality assessment. *See* GARY D. FRIEDMAN, PRIMER OF EPIDEMIOLOGY 184 (3d ed. 1987).

150. The strength of the association shows that a given factor makes some disease or disease outbreak more likely to be due to the presence of one factor more than to other factors or events and it occurs at a relatively high level or in high numbers. TIMMRECK, *supra* note 23, at 335. The strength of the association factor appears to hold much interest for the *Havner* court because the court placed a heavy burden on the plaintiff, not only to show an association between the drug and the disease, but to show a stronger association between the drug and the disease as compared to some other toxin and the disease. *See Havner*, 953 S.W.2d at 720. In essence, the plaintiff has to quell the uncertainty that presents itself when at least two possible toxins can produce one disease. *Id.* This conclusion places the plaintiff in a profoundly unfair position to establish legal certainty and shows scientific certainty through causality assessments.

151. Consistency is demonstrated when the same variables, factors, or events appear over and over in different circumstances and have the same repeated association with a disease. *Havner*, 953 S.W.2d at 718 n.2.

152. Specificity means that the toxin or agent is observed to be associated with one or just a few diseases or effects rather than with a wide variety of diseases. For example, exposure to asbestos is associated with the diseases asbestosis and mesothelioma. *See* FRIEDMAN, *supra* note 149, at 186.

153. Temporality means the logical exposure to an agent that precedes the onset of disease. *See* Elizabeth A. Stundtner, *Proving the Causation in Toxic Tort Cases: T-Cell Studies As Epidemiological and Particular Evidence*, 20 B.C. ENVTL. AFF. L. REV. 335, 347 (1993).

154. Biological gradient measures the virility of the toxin and its ability to cause a disease, and the level of susceptibility of the host. The above definition is characterized by the dose-response relationship. For example, the fact that moderate cigarette smokers have a lung cancer death rate intermediate between nonsmokers and heavy smokers is considered evidence that cigarette smoking causes lung cancer. *See* FRIEDMAN, *supra* note 149, at 184.

155. Plausibility means that association should be proved to be causal based on current biological, medical, epidemiological, and scientific knowledge. Logical analysis based on new knowledge should not interfere with or restrict obvious and common sense causal inferences. The *Havner* court mentioned plausibility, but it did not apply the exact plausibility principles when it decided to grant defendant's motion for summary judgment on the issue of factual causation. *See Havner*, 953 S.W.2d at 729–30.

156. Congruence replaces the term coherence in causality assessment. Congruence is evidence of causality when the association fits within existing knowledge and the observations and logical conclusions make scientific sense.

157. Experiment is scientific evidence of causality when knowledge and inferences about the association are based upon research that substantially support or give weight to the causal nature of the association.

158. *See id.* at 718 n.2. Analogy means that where associations are similar and have

uses admissible data from epidemiological studies to demonstrate a relative risk of greater than two, or alternatively termed a doubling of the risk, by relying on the factors that make up a causality assessment, the plaintiff will have established sufficient evidence on the specific causation prong.[159] In addition to altering the specific causation prong, the plus test requires the plaintiff to present expert testimony, with reasonable medical certainty, that other plausible causes of the injury or condition could be negated.[160] This negation or exclusion evidence is derived from Judge Weinstein's conclusion in *In re "Agent Orange" Products Liability Litigation.*[161] The *Agent Orange* court held that the plaintiffs were required to offer evidence that causation was more than fifty percent probable, and that the plaintiffs' experts were required to rule out myriad other possible causes of the veterans' afflictions.[162]

Judicial examples of the causality assessment and negation requirements, through the application of the Bradford Hill factors and the Weinstein elimination of other possible causes model, are found in *Merrell Dow Pharmaceuticals, Inc. v. Havner.*[163] In *Havner*, the Supreme Court of Texas was faced with a jury verdict and a court of appeals decision affirming a judgment in favor of plaintiffs who alleged that their infant's limb reduction birth defect was caused by the mother's ingestion of the prescription drug Bendectin.[164] The Havners based their case on products liability principles of negligence, design defects, and marketing defects.[165] The Supreme Court of Texas concentrated its efforts on analyzing the admissibility of purely scientific expert evidence, the role of epidemiological studies in establishing general and specific causation, and the role of statistics in substantiating scientific con-

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been shown to be causal, then the transfer of knowledge should be useful and by analogy the association under study can be evaluated as being causal.

159. *See id.* at 715–18.

160. *Id.* at 720.

161. 611 F. Supp. 1223 (E.D.N.Y. 1985).

162. *Id.* at 1262–63.

163. 953 S.W.2d 706 (Tex. 1997).

164. *Id.* at 709. Bendectin was formulated by Merrell Dow and its predecessors and marketed in the United States from 1957 to 1983. *Id.* at 708. Because of concerns about birth defects, more than thirty studies on Bendectin have been conducted and published. *Id.* Although the Food and Drug Administration concluded that Bendectin did not increase the risk of birth defects, Merrell Dow withdrew the drug from the market in 1983. *Id. See* Benjamin, *supra* note 110, at 155; Sanders, *supra* note 134, at 7, 18.

165. *Havner*, 953 S.W.2d at 708.

clusions.[166] However, the *Havner* court failed to analyze the rationales for its following conclusions: a physician, as opposed to a scientist, is in no position to infer specific causation;[167] "the scientific community would not accept as methodologically sound a 'study' by" a physician reporting on specific causation;[168] and the development of a purported new rule that creates a substantive requirement that plaintiffs' experts negate other plausible causes of injury with reasonable medical certainty.[169]

Merrell Dow challenged the Havners' causation evidence in the forms of a motion for summary judgment,[170] a motion in limine,[171] and a motion for directed verdict.[172] The Supreme Court of Texas's acceptance of defendant's writ of error brought plaintiffs' causation evidence back into the spotlight. The supreme court recognized that several courts have relied upon the general-specific test for causation, but it reasoned that the requirement to balance a plaintiff's right to compensation for injury with a defendant's right to be free from liability in the absence of a preponderance of the evidence required more.[173] The "more" the

166. *See id.* at 711, 713, 714–24.

167. *Id.* at 719.

168. *Id.* at 719–20.

169. *Id.* at 720.

170. *Id.* In its motion for summary judgment, Merrell Dow contended that scientifically reliable evidence that Bendectin causes limb reduction birth defects or that it caused Kelly Havner's birth defect was absent. Merrell Dow attacked the Havners' claims of both general and specific causation. *Id.*

171. *Id.* at 709. In its motion in limine—better known today as a *Daubert* hearing—Merrell Dow sought to exclude those plaintiffs' experts who would testify and provide both general and specific causation evidence. *Id.*

172. *Id.* In its motion for a directed verdict, Merrell Dow asserted that plaintiffs did not establish a prima facie case to support their theories of liability, especially the element of general causation. *Id.*

173. *Id.* at 718 (noting that general causation evidence is derived from frequency data used to assess adverse effects in general populations and this evidence cannot indicate the actual cause of a given individual's disease). Judge Owen stated:

> [T]he law must balance the need to compensate those who have been injured by the wrongful actions of another with the concept deeply imbedded in our jurisprudence that a defendant cannot be found liable for an injury unless the preponderance of the evidence supports cause in fact. The use of scientifically reliable epidemiological studies and the requirement of more than a doubling of the risk strikes a balance between the needs of our legal system and the limits of science.

Id.

The evidentiary problem this conclusion raises is that only scientists who study populations, as opposed to physicians who actually treat individual patients, will be allowed to testify on the specific causation prong, because a treating physician will not be in the posi-

Havner court spoke of is the requirement that plaintiffs' experts negate other plausible causes that could result in plaintiffs' injury or condition.[174]

Accordingly, the general-specific causation plus test mandates that inferences about specific causation cannot be drawn from epidemiological studies and, therefore, plaintiffs can never meet legal sufficiency standards with only this type of evidence.[175] In order to support the inference of specific causation, plaintiffs must present a causality assessment that shows a doubling of the risk created by defendant's conduct precipitating exposure.[176] Without this causal assessment, plaintiffs only have epidemiological studies that may be part of the evidence supporting a finding of factual causation, but which do not satisfy the standard of legal sufficiency.[177] The Supreme Court of Texas rejected the double use of epidemiological studies to support plaintiffs' theory on both the general causation prong and the specific causation prong.[178] In the *Havner* court's view, adding a "doubling of the risk" requirement to evidence of epidemiological studies would satisfy the legal sufficiency standard for factual causation.[179] A doubling of the risk or a relative risk greater than 2.0 indicates that people in the exposed population are twice as likely to contract a disease than those people in the unexposed population.[180] With each increase in the exposed population and no change in the unexposed population, a court may conclude that the defendant's conduct incrementally increases the exposed population's risk of contracting the disease.[181] Thus, the *Havner* court suggests that the doubling of the risk, although a statistical determination, is equivalent to the preponderance of the evidence standard that contemplates an either/or conclusion.[182]

The disappointing result in relying on the "doubling of the risk"

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tion to perform statistical analyses on data when she observes, evaluates, and treats only the one injured plaintiff. *See id.*

174. *Id.* at 718–20.
175. *Id.* at 720.
176. *Id.*
177. *Id.*
178. *Id.*
179. *Id.* at 721.
180. *Id.* at 722.
181. *Id.* at 722–23.
182. *Id.*

analysis is that a plaintiff who is really injured as a result of exposure to defendant's toxic agent may not recover if she cannot demonstrate a doubling of the risk to the population. This overreliance on population fails to account for the possibility that the plaintiff was injured by the toxic exposure. The "doubling of the risk" requirement is especially pernicious in light of the *Havner* court's decision to reject all physicians' opinions as scientifically unreliable as a matter of law.[183] From this conclusion, plaintiffs are foreclosed from proffering potentially reliable evidence that would properly carry great weight with the fact finder on the specific causation prong of factual causation.

The *Havner* court would only allow an inference about specific causation to be drawn if the plaintiff supported the inference by conducting a causality assessment.[184] This causality assessment is based upon factors that even epidemiologists cannot agree on in terms of their usefulness or effectiveness outside the range of population analyses.[185] In spite of these opinions, the *Havner* court looked favorably on the Bradford Hill factors even though they have been criticized as only being related to the strength of probabilistic evidence of populations and as having almost no applicability to legal conclusions about specific causation.[186] In its rule of law statement for factual causation, the *Havner* court indiscriminately chose two or three factors among the nine listed by Bradford Hill and arbitrarily assigned legal, substantive significance to them with only scant discussion of their relevance to the specific causation prong.[187] For example, the *Havner* court honed in on plausibility and elevated this factor to the status of a prerequisite for meeting the standard of legal sufficiency.[188] Thus, the Supreme Court of Texas held:

> To raise a fact issue on causation and thus to survive legal sufficiency review, a claimant must do more than simply introduce into evidence epidemiological studies that show a substantially elevated risk. A claimant must show that he or she is similar to those in the studies. This would include proof that the injured person was exposed to the same substance, that the exposure or dose levels were

183. *Id.* at 730.
184. *Id.* at 718–19.
185. *Id.*
186. *Id.* at 719.
187. *See id.* at 720.
188. *Id.*

> comparable to or greater than those in the studies, that the exposure occurred before the onset of injury, and that the timing of the onset of injury was consistent with that experienced by those in the study. . . . Further, if there are other plausible causes of the injury or condition that could be negated, the plaintiff must offer evidence excluding those causes with reasonable certainty.[189]

To require a plaintiff to present evidence excluding other plausible causes of the injury to a reasonable medical certainty for purposes of meeting the standard for legal sufficiency is akin to a court dismissing every claim for toxic exposure injuries. Plaintiffs are not the manufacturers, dealers, or retailers of toxic substances and therefore are not in a superior position to monitor the plausible causes and effects that a toxic substance will have on human health. To do so will place an unrealistic burden on plaintiffs.

According to the test proposed by the Supreme Court of Texas, a plaintiff who alleges injury from toxic exposure must become the prognosticator of plausible causes.[190] This requirement exists in Texas even though defendants, who are the experts at marketing and distributing toxic products, allegedly cannot deduce the effects of their own products on people or the environment. Several of the Bradford Hill factors listed by the supreme court are either explicit or implicit in the general-specific causation test, but the additional "plus" burden placed on plaintiffs in Texas to exclude plausible causes to a reasonable medical certainty plunges the scales of justice in favor of defendants. The *Havner* decision insures that virtually no plaintiff in Texas will meet the standard for legal sufficiency on the factual causation element in a toxic tort case. This stringent standard cannot achieve the goals of the tort system and the fairness that must be struck between possible wrongful actors and definitively injured plaintiffs. This decision also fails to account for the legal policy mechanisms that provide protections for both plaintiffs and defendants. These mechanisms include the availability of insurance, the role that distributive costs play in business development, and the judge-made principle of proximate or legal cause.

Furthermore, the *Havner* court's decision only accounts for the efficient cause of an effect or outcome by concentrating on the

189. *Id.*
190. *Id.*

possible wrongdoer. First, the *Havner* court should have considered whether the physical cause, the agent or toxin, contributed to the harm. Second, the court should have realized that the defendant indeterminacy problem should not have shielded a wrongful actor completely to the detriment of the injured plaintiff. Finally, the *Havner* court should have considered the association the defendants had to both the physical cause and the injured party for purposes of establishing a link or nexus based upon a hybrid philosophical approach to show factual causation. While the general-specific causation test implicitly considers the association between physical causes and injured parties, the frequency, regularity, and proximity test makes explicit use of the association.

3. Frequency, Regularity, and Proximity

The frequency, regularity, and proximity test is a new rule governing the specific causation prong of medical causation adopted by the New Jersey Supreme Court in cases in which a plaintiff has been exposed to a variety of toxic products and cannot attribute an injury to a specific product or defendant.[191] The test does not alter the requirement for plaintiffs to demonstrate general causation, i.e., that a toxin is capable of causing the disease complained of by plaintiffs (causal nexus).[192] However, the frequency,

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191. *See, e.g.*, James v. Bessemer Processing Co., 714 A.2d 898 (N.J. 1998). In New Jersey toxic tort cases, courts refer to the factual causation element as medical causation. Thus, under these types of cases, a plaintiff must prove medical causation—that the plaintiff's injuries were proximately caused by exposure to the defendant's product. Proof of medical causation is a requirement of cases involving occupational exposure to toxic materials as well as of cases involving asbestos exposure. To prove medical causation in New Jersey, a plaintiff must show that the exposure to each defendant's product was a substantial factor in causing or exacerbating the disease. Because of the extraordinary and unique burdens facing plaintiffs who seek to prove causation in toxic tort litigation, specifically, long latency periods, multiple products, and multiple defendants, New Jersey courts recognize that satisfying the substantial factor test is a formidable task. Accordingly, the New Jersey Supreme Court has held that strong circumstantial evidence would suffice to establish that defendant was a substantial factor in causing plaintiff's injury. *Id.* at 908–10. Specifically, the court adopted the frequency, regularity, and proximity test to establish liability in the multiple defendant asbestos and occupational exposure contexts. Thus, in order to prove that exposure to a specific defendant's product was a substantial factor in causing or exacerbating plaintiff's disease, the plaintiff is required to prove an exposure of sufficient frequency, with regularity of contact, and with the product in close proximity to the plaintiff. *Id.*

192. *See id.* at 911.

regularity, and proximity test does relax the prevailing specific causation tests, namely, the probabilistic evidence of specific causation under the *Havner* rule or that plaintiffs' injuries are similar to those in an exposed population.[193] The test allows plaintiffs in asbestos and occupational exposure cases to present circumstantial, synergistic evidence of the cumulative effect of exposure to toxins.[194] Application of the frequency, regularity, and proximity test necessarily focuses on the cumulative effects of (1) exposure over a prolonged period of time; (2) the dosage of exposure; and (3) the mode of absorption into the human body.[195]

Application of the frequency, regularity, and proximity test for specific causation typically arises in asbestos and occupational exposure cases. One such case is *James v. Bessemer Processing Co.*[196] Walter James worked for Bessemer Processing for twenty-six years as a general laborer in its business of cleaning and reconditioning used and empty fifty-five-gallon drums for further use by the petroleum industry and other chemical manufacturers.[197] Bessemer used a multi-staged process to clean and recondition the drums.[198] The process included uncapping the heads of the drums, emptying the drums, incinerating residue, sand blast-

193. *Id.*

194. *See id.* at 913 (holding that plaintiff's proofs provided sufficient product identification with regard to the petroleum defendants to survive summary judgment). Plaintiff's toxicologists could rely on the physical description of James's co-workers to support his expert opinion that the fumes and residues described were of petroleum-based products containing sufficiently high levels of benzene and polycyclic aromatic hydrocarbons (PAHs) to cause James's cancer. *Id.* Jurors could rely both on that expert testimony and on the factual testimony of the lay witnesses to determine whether plaintiff proved exposure to the petroleum-based products. *Id.* A rational fact finder could also conclude from the co-workers' testimony that James was frequently, regularly, and proximately exposed to defendants' products containing known carcinogens, and thus could conclude that James's exposure to the petroleum products of each defendant was a substantial factor in causing or exacerbating his disease. *Id.*

195. *See id.* at 911. With the adoption of the frequency, regularity, and proximity test, the *Bessemer* court moved away from the insurmountable obstacles facing the plaintiff, such as long latency periods, multiple products, and indeterminate defendants, in order to strike a balance with regard to proof of causation that is fair to both plaintiffs and defendants in view of the almost certain lack of direct scientific proof in toxic tort cases. *Id.* at 909. The *Bessemer* court stated that adoption of this new standard is required by the unique difficulties faced by a plaintiff attempting to establish causation in the toxic tort context "'[s]ince proof of direct contact is almost always lacking . . . courts must rely upon circumstantial proof of sufficiently intense exposure to warrant liability.'" *Id.* at 901 (quoting Sholtis v. Am. Cyanamid Co., 568 A.2d 1196, 1207 (N.J. Super. 1989)).

196. *Id.* at 898.

197. *Id.* at 902–03.

198. *Id.*

ing the drums, washing the drums in a nitrate solution, sealing and testing the drums, rewashing the drums, then drying and painting the drums.[199] Following this reconditioning, Bessemer either resold or returned the drums to the suppliers for reuse.[200]

Plaintiff offered direct lay testimony that during each stage of the reconditioning process, noxious fumes escaped and exposed the workers to all types of petroleum products and chemicals.[201] In addition, plaintiff offered direct lay testimony that her husband performed every job required at the Bessemer plant including "cutting the heads off drums; operating the incinerator, sand blaster, rolling machines, and heading machines; welding and painting drums; and . . . cleaning the slop hole."[202] James was diagnosed with stomach cancer in 1989, and he died in 1990 from carcinoma with metastasis to the liver and peritoneum.[203] James's widow brought wrongful death and survival actions against Bessemer and other defendants.[204] She alleged that the petroleum and chemical manufacturers and Bessemer failed to warn her husband of the dangerous toxicity of the substances in the drums.[205] She also alleged that her husband's continuous exposure to those substances caused his illness and death.[206]

Consistent with the trial strategies of toxic tort defendants, Bessemer and the petroleum and chemical manufacturers were granted a summary judgment motion on the ground that plaintiff would be unable to establish that her husband's cancer was caused by specific products manufactured by specific defendants.[207] The appellate division reversed.[208] Defendants chal-

199. *Id.*
200. *Id.*
201. *Id.* at 904–05.
202. *Id.* at 903.
203. *Id.*
204. *Id.* at 901.
205. *Id.*
206. *Id.*
207. *Id.* The language in the trial court's decision is quite telling as to which party is favored in the toxic tort litigation system. A grant of summary judgment on the ground that a plaintiff "would be unable to establish that James's cancer was caused by specific products manufactured by specific defendants" reads like a classic preemptive strike. *Id.* Defendants rely and prevail on the obvious argument that no one has yet to prove a direct causal link between exposure to a toxin and injury. Therefore, because these direct ontological links are impossible to prove, liability should not extend to a defendant engaged in the manufacture, distribution, or marketing of a toxic chemical.
208. *See id.*

lenged the appellate division's reversal of the grant of summary judgment.[209] Thus, the New Jersey Supreme Court had to determine if a plaintiff could establish proof of specific causation after applying the frequency, regularity, and proximity test in a toxic tort failure to warn case,[210] even though plaintiffs faced problems of multiple products and indeterminate defendants.[211]

The plaintiff presented expert testimony from a toxicologist and a medical doctor.[212] On the general causation prong, the toxicologist's testimony showed that exposure to specific chemicals contained in petroleum products in the work place were probable human carcinogens, meaning that they more likely than not cause cancer.[213] On the specific causation prong, the medical expert's testimony showed that James "absorbed one or more of these carcinogens through his gastrointestinal tract and through his lungs. These chemicals then spread to his stomach causing a derangement of DNA mechanism such that one or more of the cells grew in an uncontrolled fashion, clinically known as cancer."[214]

Before agreeing with the appellate division's decision to apply

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209. *Id.*

210. New Jersey's frequency, regularity, and proximity test was sanctioned by the appellate division in *Sholtis v. Am. Cyanamid Co.*, 568 A.2d 1196, 1207 (N.J. Super. 1989).

211. *Bessemer*, 714 A.2d at 902. A finding that plaintiff established factual causation in this case would mean that the conundrum of the indeterminate defendants and multiple products would not, as a matter of law, defeat plaintiff's claim for damages based on toxic exposure. The proof required to meet legal sufficiency may be analogous to what commentators and courts refer to as minimal showings of legal sufficiency and weak preponderance of the evidence standards. However, the author believes that the term best invoked at this stage of the proceedings is the satisfaction of the standard for legal sufficiency by reliance on strong circumstantial evidence. This standard requires parties to present enough evidence to support a decision that reasonable minds could differ as to the material facts or the inferences to be drawn from those facts. Accordingly, at the summary judgment stage in toxic tort litigation, judges should refrain from engaging in oppressive judicial activism that would undermine equitable principles. The assault on the legal sufficiency standard is best observed by overzealous judges who make credibility determinations that usurp the role of the jury. Instead, judges should hold gatekeepers responsible for admissibility issues, like qualification and reliability, and decision-makers responsible for ensuring that genuine issues of material fact reach the jury. The standard of legal sufficiency is abused in favor of defendants when judges supplant what they conclude is believable with that which reasonable jurors can reasonably disagree after being presented with admissible expert testimony that supports opposing theories regarding factual causation.

212. *Id.* at 905.

213. *Id.*

214. *Id.* at 906.

the frequency, regularity, and proximity test to the specific causation prong, the New Jersey Supreme Court stated:

> By far the most difficult problem for plaintiffs to overcome in toxic tort litigation is the burden of proving causation. In the typical tort case, the plaintiff must prove tortious conduct, injury and proximate cause. Ordinarily, proof of causation requires the establishment of a sufficient nexus between the defendant's conduct and the plaintiff's injury. In toxic tort cases, the task of proving causation is invariably made more complex because of the long latency period of illnesses caused by carcinogens or other toxic chemicals. [The] fact that ten or twenty years or more may intervene between the exposure and the manifestation of disease highlights the practical difficulties encountered in the effort to prove causation.[215]

In this statement, the court recognized the inherent advantage that defendants have in toxic tort litigation because of their status as indeterminate parties and the tort system's recent reliance on ontological views to substantiate using scientific traceability theories as the only means to establish factual causation.[216]

To balance the scales between parties to a toxic tort case, the *Bessemer* court turned to the frequency, regularity, and proximity test, which would allow plaintiffs to establish the liability of multiple defendants.[217] The *Bessemer* court stated:

> [I]n order to prove that [plaintiff's] exposure to a specific defendant's toxic product was a substantial factor in causing or exacerbating the plaintiff's disease, the plaintiff is required to prove "an exposure of sufficient frequency, with a regularity of contact, and with the product in close proximity" to the plaintiff. [S]uch a standard [is] required by the unique difficulties faced by a plaintiff attempting to establish causation in the toxic-tort context: "[S]ince proof of direct contact is almost always lacking . . . courts must rely upon circumstantial proof of sufficiently intense exposure to warrant liability."[218]

The test limits liability to defendants whose products to which the plaintiff can demonstrate she was "intensely exposed."[219] Re-

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215. *Id.* at 909 (quoting Ayers v. Jackson Township, 525 A.2d 287, 301 (N.J. 1987)).

216. *See id.*

217. *See id.* at 901.

218. *Id.* at 910 (quoting Sholtis v. Am. Cyanamid Co., 568 A.2d 1196, 1207 (N.J. Super. 1989)).

219. *See id.* The court stressed "that the 'frequency, regularity, and proximity' test bears no relationship to theories of collective liability that some courts have adopted in contexts where the specific tortfeasor or tortfeasors that caused the plaintiff's injury can-

lying on policy principles, the court held that a plaintiff demonstrates medical causation in an occupational exposure toxic tort case by satisfying two prongs.[220] Plaintiffs must show general causation by "medical and/or scientific proof of a nexus between the exposure and the plaintiff's condition," in addition to specific causation by "factual proof of the plaintiff's frequent, regular, and proximate exposure to a defendant's product."[221] The frequency, regularity, and proximity test relaxes the specific causation requirement found in both traditional tort cases and toxic tort cases where courts have chosen to conform to the ontological view of science and traceability theory to recognize a causal connection between a toxin, an exposure, and an injury. Instead of requiring direct traceability, the frequency, regularity, and proximity test permits reliance on the hybrid philosophical approach to analyzing factual causation, which places weight on observations of an event. For example, this could involve exposure to a carcinogen and the expected result or injury that is consistent with exposure to a toxin.[222]

Of the three tests for factual causation, the frequency, regularity, and proximity test is by far the most advantageous to toxic exposure plaintiffs. But instead of tipping the scales of justice in favor of plaintiffs, the frequency, regularity, and proximity test only begins to contract the unreasonable litigation advantages enjoyed by defendants under both the general-specific causation and the general-specific causation plus tests.

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not be identified." *Id.*

220. *Id.* at 911.

221. *Id.* Upon applying both prongs of the "frequency, regularity, and proximity test," the New Jersey Supreme Court agreed with the appellate division that granting defendant's summary judgment motion was premature. *Id.* The lay testimony sufficiently adduced that James's employment responsibilities brought him in repeated contact with various chemicals over a period of twenty-six years. *Id.* at 901, 912. Furthermore, expert testimony sufficiently demonstrated that James's cumulative exposure to toxic chemicals present in the petroleum-based products caused his stomach and liver cancer. *Id.* at 906. The court reached this conclusion even though plaintiff could not precisely identify the exact chemical he was exposed to during his employment. *Id.* at 913. The court did not require plaintiff to provide such information because the defendants kept no records of the types of chemicals it shipped in the fifty-five-gallon drums. *Id.* Because of faulty record keeping, the court shifted this burden on defendants to prove each was not a party responsible for James's exposure. *Id.* at 913–14.

222. *See id.* at 911.

III. BURDEN OF PROOF FOR CAUSATION IN TOXIC TORT LITIGATION

In most jurisdictions, a toxic tort plaintiff must hurdle at least three critical procedural obstacles in order for a toxic tort case to reach the jury. First, the plaintiff must survive a motion for summary judgment based upon inadmissibility of expert scientific and medical testimony.[223] Second, the plaintiff must survive a motion for summary judgment based upon lack of sufficient evidence to support a finding of factual causation.[224] Third, the plaintiff must survive a motion for directed verdict based upon a failure to prove all elements of a toxic tort claim by a preponderance of the evidence.[225] Thus, the toxic tort plaintiff has the bur-

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223. "One of the principle purposes of the summary judgment rule is to isolate and dispose of factually unsupported claims or defenses." Celotex Corp. v. Catrett, 477 U.S. 317, 323–24 (1986). Justice Rehnquist interpreted the summary judgment rule to require an adequate time for discovery and, after which, the moving party must come forward with the basis for the motion and citations to the portions of discovered materials that prove the absence of any genuine issues of material fact. *Id.* at 322. Even though the moving party is required to prove the absence of a genuine issue of material fact, she is not required to disprove or negate the opponent's claims. *Id.* at 323. Then, the burden shifts to the party opposing the motion to make a sufficient showing on an essential element of the prima facie case. *Id.* at 322. The party opposing the motion may not rely on the pleadings or mere denials of the allegations. Id. at 324. Instead, the party must adduce some evidence showing that material facts are in dispute. *Id.* The party opposing the motion can adduce such evidence that specific facts present a genuine issue of material fact through "depositions, affidavits, answers to interrogatories, and admissions on file." *Id.*; *see also* Chikovsky v. Ortho Pharm. Corp., 832 F. Supp. 341, 346 (S.D. Fla. 1993) (granting defendant's motion for summary judgment on the basis that plaintiff's expert's testimony was inadmissible because the expert's opinion was not based upon scientifically valid principles or methodology).

224. *See* Backes v. Valspar Corp., 783 F.2d 77, 78 (7th Cir. 1986). The court reversed the trial court's grant of summary judgment in favor of defendants because an expert chemist, formerly employed by the Illinois Environmental Protection Agency, opined in an affidavit on behalf of plaintiff that the two wells on plaintiff's property had been contaminated and that the plaintiff's children's injuries "might or could have been caused" by drinking the water. *See id.* Judge Posner wrote:

> [A]t the summary judgment stage, the burden of proof is on the moving party, in this case the defendant, to show that the outcome of a trial would be a foregone conclusion because with discovery complete the opposing party has turned up no evidence of an essential element of his case or defense.
>
> If [the expert] was competent to offer opinion evidence, the plaintiff put in enough evidence, though only barely so, to defeat a motion for summary judgment.

Id. at 78–79 (citations omitted).

225. *See* Elam v. Alcolac, Inc., 765 S.W.2d 42, 174 (Mo. Ct. App. 1988).

> A toxic tort plaintiff, as any other, bears the burden to prove the facts essential to a prima facie case. The plaintiff also bears the risk of nonpersuasion and must show by a preponderance, or greater weight, of the evidence that

den to provide evidence of facts, mostly scientific and medical, which show a genuine issue of material fact necessary to survive a motion for summary judgment, and indicate the existence of factual causation more than the non-existence of causation to survive a motion for a directed verdict.[226]

A. *Admissibility of Expert Testimony and Factual Causation*

Because the issue of factual causation in toxic tort cases is complex, expert testimony is crucial, especially to those courts that rely heavily on the ontological approach. Before an expert can give a scientific or medical opinion about factual causation, the judge must be satisfied that the witness is qualified to render an expert opinion.[227] Next, the judge must be satisfied that the subject of the expert's testimony will have evidentiary relevance and reliability.[228] Regarding evidentiary relevance, the trial judge

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> the injury was the result of the negligence of the defendant. The greater weight of the evidence does not mean evidence that engenders certainty in the trier of fact, but which—"when the last word has been spoken in the trial of a case"—prompts a greater probability of confidence in the evidence of one party over the other.

Id. at 174–75 (citations omitted).

226. *See* 1 ROBERT E. SHIELDS, A GUIDE TO TOXIC TORTS § 10.01[2][b] (1999). Mr. Shields notes:

> The plaintiff must establish that causation is more probable than not. Courts have equated this requirement with the determination of a probability exceeding 50 percent. Moreover, the law approaches the problem of proof in an all-or-nothing fashion. If the plaintiff establishes that the probability of causation is at least 51 percent, then the plaintiff is entitled to recover for the full amount of his damages. On the other hand, if the plaintiff can only establish that the probability of causation is 49 percent instead of 50 percent, then the plaintiff does not recover at all.

Id. The Guide discusses the burden of proof and the burden of persuasion as one integrated test or standard for determining both the prima facie case and a jury's belief of the relative truth based upon its weighing of the evidence presented to support each party's version of the case. *See id.* at ch. 10. One author characterized this integration as the collapsing of two burdens into a single haphazard, meaningless standard. Steve Gold, *Causation in Toxic Torts: Burdens of Proof, Standards of Persuasion, and Statistical Evidence*, 96 YALE L.J. 376, 384–87 (1986). The single standard does not account for the two-tiered system of justice requiring prima facie case presentation and then, in the face of a question of fact, a balancing or weighing of evidence to arrive at belief probability. *See id.* at 386.

227. *See* FED. R. EVID. 702, 703 (governing the admissibility and use of expert witness testimony in federal court).

228. *See* Daubert v. Merrell Dow Pharm., Inc., 509 U.S. 579, 589–91 (1993). The *Daubert* court held that even though the *Frye* test was displaced by the Federal Rules of Evidence in federal cases, that this does not mean

is obligated to ensure that the expert's testimony is (1) based upon scientific, technical, or other specialized knowledge that will (2) assist the trier of fact to understand the evidence or to determine a fact in issue, and (3) will comport with the requirement of fit, i.e., the degree to which an expert's testimony is sufficiently tied to the facts of the case.[229] As to evidentiary reliability, the trial judge must assess the validity of the technique or methodology that is the basis for the expert's opinion.[230] To determine scientific validity, the trial judge must conduct a flexible inquiry that focuses solely on the technique or methodology used by the expert, not on the conclusions each generates.[231] Even if the judge determines that an expert's testimony satisfies evidentiary relevance and reliability, the judge still has the opportunity to exclude such evidence if its probative value is substantially outweighed by the danger of unfair prejudice.[232] Finally, the trial judge's decision to admit or exclude scientific evidence is subject only to an abuse of discretion standard of review because the judge's gatekeeping role falls squarely within evidentiary rulings.[233]

> that the Rules themselves place no limits on the admissibility of purportedly scientific evidence. Nor is the trial judge disabled from screening such evidence. To the contrary, under the Rules the trial judge must ensure that any and all scientific testimony or evidence admitted is not only relevant, but reliable.

Id. at 589.

229. *See id.* at 592; *see also* FED. R. EVID. 702.

230. *See Daubert*, 509 U.S. at 592–93.

231. *Id.* at 594–95. The inquiry may be based on whether the technique or methodology (1) "can be (and has been) tested"; (2) "subjected to peer review and publication"; (3) conditioned upon a "known or potential rate of error"; and (4) generally accepted in the "relevant scientific community." *Id.* at 593–94. Many factors will bear on the inquiry, but even though the Court did not presume to set out a definitive checklist or test, it felt that some general observations were appropriate. *Id.* However, a trial judge may consider several more or different specific factors that might bear on the gatekeeping determination. *See* Kumho Tire Co. v. Carmichael, 526 U.S. 137, 141 (1999). The "gatekeeping inquiry must be 'tied to the facts' of a particular 'case.'" *Id.* at 150 (quoting *Daubert*, 509 U.S. at 591). Thus, the *Daubert* "list of factors was meant to be helpful, not definitive." *Id.* at 151. Indeed, the *Daubert* "factors do not all necessarily apply even in every instance in which the reliability of scientific testimony is challenged." *Id.*

232. *Daubert*, 509 U.S. at 595. "Expert evidence can be both powerful and quite misleading because of the difficulty in evaluating it. Because of this risk, the judge in weighing possible prejudice against probative force under Rule 403 of the present rules exercises more control over experts than over lay witnesses.'" *Id.* (quoting Jack B. Weinstein, *Rule 702 of the Federal Rules of Evidence Should Not Be Amended: It Is Sound*, 138 F.R.D. 631, 632 (1991)).

233. *See* Gen. Elec. Co. v. Joiner, 522 U.S. 136, 142 (1997). In *Joiner*, the Court stated

Despite the Supreme Court's lengthy treatment of the standards for admissibility of expert testimony, federal and state trial courts still retain significant power to either admit or exclude, consistent with their respective philosophical approaches, expert testimony on factual causation in toxic tort litigation. For example, some state courts still adhere to the general acceptance test for admissibility of expert testimony;[234] while federal trial courts, since *Daubert*, have differed substantially in execution of their gatekeeping role.[235] Some courts liberally admit testimony from qualified experts, while others insist on rigorous scientific verification based upon exacting standards.[236] In toxic tort cases, these gatekeeping determinations are critical, being virtually dispositive of a case when expert testimony is mandatory on the issue of factual causation. No one admissibility test or application of that test seems favored by the various courts presiding over toxic tort cases. This phenomenon creates doubts for toxic tort litigants who must assess their ability to procure admissible expert testimony or evidence on the crucial and dispositive issue of factual causation.

With respect to the admissibility of expert scientific or medical testimony on the issue of factual causation, the role of the judge is to decide the relevance and reliability of the testimony, not the

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that:

> [w]hile the Federal Rules of Evidence allow district courts to admit a somewhat broader range of scientific testimony than would have been admissible under *Frye*, they leave in place the "gatekeeper" role of the trial judge in screening such evidence. A court of appeals applying "abuse-of-discretion" review to such rulings may not categorically distinguish between rulings allowing expert testimony and rulings disallowing it.

Id.

234. *See* Frye v. United States, 293 F. 1013, 1014 (D.C. Cir. 1923) (establishing the test of general acceptance within the scientific community); *see also* Logerquist v. McVey, 1 P.3d 113, 114 (Ariz. 2000) (discussing *Frye* and *Daubert* as applicable to ARIZ. R. EVID. 702); Fishback v. People, 851 P.2d 884, 889 (Colo. 1993) (application of *Frye* general acceptance test to admissibility of novel scientific evidence); Berry v. CSX Transp. Inc., 709 So. 2d 552, 555–57 (Fla. Dist. Ct. App. 1998) (citing to *Frye* for general acceptance test); Goeb v. Taraldson, 615 N.W.2d 800 (Minn. 2000) (questioning use of *Frye* test for novel scientific evidence instead of *Daubert*).

235. *Compare In re* Paoli R.R. Yard PCB Litig., 916 F.2d 829, 836 (3d Cir. 1990) (liberally construing the Federal Rules of Evidence to resolve doubt about scientific validity in favor of admissibility), *with* Christophersen v. Allied-Signal Corp., 902 F.2d 362 (5th Cir. 1990), *aff'd on reh'g*, 939 F.2d 1106, 1114–15 (5th Cir. 1991) (using a restrictive view of the Federal Rules of Evidence and exercising the gatekeeping role to exclude scientific evidence when irrelevant and unreliable).

236. *See id.*

correctness or persuasiveness of the expert's conclusion.[237] However, many judges overstep the role of gatekeeper by deciding on the correctness of experts' opinions, with the general results being orders granting summary judgment in favor of defendants. Deciding on the correctness of an expert's opinion at the summary judgment stage presumes that scientists and medical professionals know with certainty the answers to factual causation questions raised in toxic tort cases. It is "unreasonable to conclude that the subject of scientific testimony must be known to a certainty; when arguably there are no certainties in science."[238] Scientists do not testify to immutable truths; rather, they search for theories to help explain phenomena.[239] Thus, for a trial judge to go beyond the gatekeeping role into the domain of the trier of fact is a critical mistake that can prove to be fatal to a toxic tort plaintiff's case. Trial judges should err on the side of caution when exercising their gatekeeping role in order to ensure against the improper conversion of an evidentiary determination into a substantive determination on the issue of factual causation.[240]

At the summary judgment stage, the scientific expert should not be measured by a standard of believability or persuasion. Rather, the scientific expert's purpose is to present her theories on the issue of factual causation and to assist the jury in understanding the factual predicates that support her theories. A judge should not express, through a grant of summary judgment, her opinion about the correctness of the expert's testimony. Instead, the judge should remain neutral in spite of her own beliefs about the persuasiveness or correctness of an expert's opinion because

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237. FED. R. EVID. 702, 703.

238. *Daubert*, 509 U.S. at 590.

239. *See id.*

240. *See* Robertson v. White, 635 F. Supp. 851 (W.D. Ark. 1986), *rev'd on other grounds sub nom.* Arthur Young & Co. v. Reves, 856 F.2d 52 (8th Cir. 1988). "Summary judgment should be 'cautiously invoked' so that no person will be improperly deprived of his Seventh Amendment right to a jury trial." *Id.* at 870. The Seventh Amendment provides:

> In Suits at common law, where the value in controversy shall exceed twenty dollars, the right of trial by jury shall be preserved, and no fact tried by a jury shall be otherwise re-examined in any Court of the United States, than according to the rules of the common law.

U.S. CONST. amend. VII.

Thus, it is only when no genuine issue of material fact exists that a federal district court may grant summary judgment pursuant to Federal Rule of Civil Procedure 56 without violating the Seventh Amendment. *See* Shore v. Park Lane Hosiery Co., 565 F.2d 815, 819 (2d Cir. 1977).

the appropriate determiner of believability and persuasiveness is the trier of fact.

B. *Legal Certainty, Reasonable Scientific/Medical Certainty, and Factual Causation*

Unfortunately, the standard for reasonable scientific/medical certainty[241] is not clearly defined in toxic tort jurisprudence.[242] This oversight creates a challenge for litigants, particularly plaintiffs, who must rely on scientific and medical testimony to establish factual causation.[243] Even more challenging for litigants is determining the impact that the reasonable medical certainty standard has on admissibility standards, legal sufficiency standards, and preponderance of evidence standards.[244]

In addition, problems arise when courts make vague or unde-

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241. The term "reasonable medical certainty," when used generally in this article, will encompass both scientific and medical testimony. However, the term will be split into "reasonable scientific certainty" and "reasonable medical certainty" when drawing distinctions between the disciplines of research science (yielding, for example, epidemiological information) and medical science (relating, for example, to clinical observation and treatment).

242. *See* Jeff L. Lewin, *The Genesis and Evolution of Legal Uncertainty about "Reasonable Medical Certainty,"* 57 MD. L. REV. 380, 380 (1998). Professor Lewin begins his article that "traces the history of the creation and dissemination of the phrase 'reasonable medical certainty'" with the astonishingly appropriate statement that "[a]lthough judges expect, and sometimes insist, that expert opinions be expressed with 'reasonable medical certainty,' and although attorneys ritualistically intone the phrase, no one knows what it means!" *Id.*

243. The phrase "reasonable medical certainty" has "achieved 'occult' or 'talismanic' status in the interrogation of medical witnesses" even though the term remains ill defined with only vague glimpses of legal, scientific, or medical meaning. *Id.* at 385. "[T]he phrase seems to have various meanings in different jurisdictions and different contexts, generating substantial confusion among the bench and bar, as well as for physicians who are called upon to provide expert testimony." *Id.* at 385–86. Expert testimony also poses issues with regard to jury trials because

> "[y]ou can't get to the jury without an expert in most cases today. . . ." In addition, challenges "make trials incredibly burdensome for plaintiffs . . . [because they] are forced to litigate expert issues twice, once before the judge in a mini-trial on the expert, and if you survive that, you have to bring the expert back at trial." "The weaker economic party will be hurt, which is usually the plaintiff. . . ."

James L. Dam, *Expert Testimony Is Harder to Use: U.S. Supreme Court*, LAW. WKLY. USA, Apr. 5, 1999, at 1 (quoting two plaintiff's attorneys).

244. For example, "[n]o consensus exists among judges, attorneys, or academic commentators as to whether 'reasonable medical certainty' means 'more probable than not' or 'beyond a reasonable doubt,' or something in between." Lewin, *supra* note 242, at 380.

fined allusions to the reasonable medical certainty standard.[245] For example, the standard for reasonable medical certainty may not necessarily be the same for scientists and medical professionals because the former testimony is typically elicited on the general causation prong of factual causation while the latter is elicited on the specific causation prong of factual causation. This demarcation is significant because most scientific evidence on the general causation prong is largely based upon probabilistic or statistical evidence regarding populations, whereas medical evidence on the specific causation prong is based upon particularistic evidence geared toward the individual plaintiff. Thus, courts may be erroneously applying the reasonable medical certainty standard cited in legal discourse to scientists and physicians alike, even though physicians typically do not draw causal inferences on purely probabilistic studies of groups.[246]

In tort law, courts associate legal certainty with the fifty-one percent probability or "the more likely than not" standard that defines a preponderance of the evidence.[247] The more probable than not standard measures the extent to which one party's theory of the case or proposition is more likely true than not.[248] The legal certainty standard requires courts and juries to view the presentation of a case according to an either/or paradigm. This paradigm is often translated into truth versus untruth. Even though there is a wide range between truth and untruth, the legal certainty standard defines truth by a fifty-one percent probability, with untruth representing the remainder. The quest to achieve legal certainty is embodied in the reasonable certainty rule, a rule of evidence adopted to prohibit speculative or conjectural opinions on the issue of damages. Professor Lewin explains that "[t]he reasonable-certainty rule . . . relates to the standard of proof for establishing damages, especially with respect to conditions or illnesses that the plaintiff might suffer in the future."[249]

245. *See id.* at 386.

246. Where the preponderance standard is based upon a fifty-one percent probability, scientists studying populations and drawing scientific conclusions based upon probabilities may be able to perform a crude conversion. But physicians do not necessarily treat individual patients on statistical or probable bases; therefore, a conversion of the physician's opinion to a probability may be akin to comparing apples with oranges.

247. *See*, Beecher-Monas, *supra* note 102, at 1099.

248. *See id.* at 1099 n.319 (citing Richard Lempert, *The New Evidence Scholarship Analyzing the Process of Proof*, 66 B.U. L. REV. 439, 451–52 (1986)).

249. Lewin, *supra* note 242, at 408.

Professor Lewin also notes that the reasonable certainty rule was created "[t]o prevent sympathetic juries from awarding substantial damages based on speculation."[250]

Unlike the legal certainty standard applied to the element of factual causation to determine its existence, the scientific standard only demonstrates the probabilities of cause. For example, the scientist may or may not infer the existence of a causal relationship between an agent and a disease in the population.[251] Such causal inferences are based on many factors, like the confidence interval, statistical significance testing, and the presence of confounders.[252] The confidence interval measures the confidence of the probability that an association between an agent and a disease exists.[253] Confidence intervals are purely statistical measures of association that are limited by statistical significance testing.[254] Statistical significance testing measures the probability that the observed data will depart from the null hypothesis.[255] For example, the scientist will measure the frequency with which the data departs from the hypothesis that an agent has no effect on the population.[256] The purpose of statistical significance testing is to account for the probability that a disease occurs by chance as opposed to exposure to a toxic agent.[257] If there is less than a five percent probability that the data will depart from the null hypothesis, the association between the exposure and the disease is considered statistically significant.[258] However, a probability in excess of five percent suggests that the association is not statisti-

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250. *Id.*

251. *See* Beecher-Monas, *supra* note 102, at 1108–09.

252. For a discussion of confounders, see *supra* note 37.

253. *See* FRIEDMAN, *supra* note 149, at 33–34, 218–19; *see also* TIMMRECK, *supra* note 23, at 232.

254. *See* FRIEDMAN, *supra* note 149, at 199.

255. *See* Merrell Dow Pharm., Inc. v. Havner, 953 S.W.2d 706, 722 (Tex. 1997).

256. In *Havner*, the court stated:

> A researcher tests hypotheses and does so by testing whether the data support a particular hypothesis. The starting point is the null hypothesis, which assumes that there is no difference or no effect. . . . The researcher tries to find evidence *against* the hypothesis. The statement that the researcher suspects may be true is stated as the alternative hypothesis. If a significant difference is found, the null hypothesis is rejected. If a significant difference is not found, the null hypothesis is accepted.

Id. at 722 (citations omitted).

257. FRIEDMAN, *supra* note 149, at 198.

258. *Id.* at 189; *see also* Beecher-Monas, *supra* note 102, at 1100–01.

cally significant.[259] Statistical significance testing looks at the limits of the confidence interval range.[260] Some scientists believe that the primary focus should be on the approximate position of the interval as a whole, not on the ends of the confidence interval.[261] These conventions of scientific study are patently distinct from the conventions of legal resolution of controversy and, thus, their respective inferences and outcomes should not be blindly equated or commingled.

Apart from both legal certainty and scientific certainty, the medical standard for certainty embodies the validity of clinical observations and differential diagnoses to arrive at the source or cause of the injury being treated.[262] Clinical observations and differential diagnoses are necessarily performed on a case by case basis because the goal of the medical professional is to treat the individual patient.[263] This case-by-case requirement for treatment makes any standard or uniform convention for differential diagnoses impossible.[264] Despite the potential for different methods, there are norms in the medical community that form a skeletal outline for conducting differential diagnoses.[265] The most basic norms are diagnoses based upon clinical observations, which include taking a clinical history and conducting a physical examination.[266] From these two categories, medical professionals are able to render differential diagnoses in order to treat an injured patient.[267] Differential diagnosis "'describe[s] a process whereby medical doctors experienced in diagnostic techniques provide testimony countering other possible causes . . . of the injuries at issue.'"[268] The result of a differential diagnosis is a physician's in-

259. *See* FRIEDMAN, *supra* note 149, at 199.

260. *See id.* at 198–99.

261. *See* Beecher-Monas, *supra* note 102, at 1105.

262. *See, e.g.*, Cottle v. Superior Court, 5 Cal. Rptr. 2d 882 (Cal. Ct. App. 1992).

263. *See In re* Paoli R.R. Yard PCB Litig., 35 F.3d 717, 758 (3d Cir. 1994), *aff'd in part and rev'd in part*, 221 F.3d 449 (3d Cir. 2000).

264. *See id.*

265. *See id.*

266. *See* FRIEDMAN, *supra* note 149, at 37–38.

267. *See* Farber, *supra* note 115, at 1257 (1987); *see also* Cottle v. Superior Court, 5 Cal. Rptr. 2d 882 (Cal. Ct. App. 1992); Earl v. Cryovac, 772 P.2d 725 (Idaho Ct. App. 1989).

268. *See* Berry v. CSX Transp., Inc., 709 So. 2d 552, 562 n.9 (Fla. Dist. Ct. App. 1998) (quoting Hines v. Consol. Rail Corp., 926 F.2d 262, 270 n.6 (3d Cir. 1991)). In *Berry*, the court held that "under *Frye* and its Florida progeny, when [an] expert's opinion is well-founded and based upon generally accepted scientific principles and methodology, it is not

ference or conclusion about the cause of an injury.[269] Further, the medical professional may account for the cause of the disease with far less than fifty-one percent probability because the medical professional must assess the patient's complaint, the history of the complaint, any other illnesses the patient may have, and the patient's occupation and habits.[270] From this information, it is possible for the physician to arrive at more than one cause for a plaintiff's injury.[271] To hone in on cause, the physician uses the collected medical information to perform a differential diagnosis to rule out possible alternative diseases and causes of these diseases by outlining the possibilities and further narrowing them based upon the physician's experience.[272] It is obvious that this technique for identifying a cause does not fit snugly within the either/or paradigm or the scientist's probabilistic schema.

Considering the different objectives and goals of the legal community, the scientific community, and the medical community in ascertaining certainty on the issue of factual causation, it is not necessarily appropriate or equitable to apply one certainty standard to each unique discipline. Instead, courts should consider the objectives, goals, and limits placed on the experts in each discipline and then determine a certainty standard commensurate with the unique exigencies of each discipline. Presently, courts view reasonable scientific/medical certainty as they do legal certainty, where legal certainty is the ability, with fifty-one percent probability, to establish truth through an either/or proposition using controversy testing.[273] For example, the evidence, as a whole, either supports the plaintiff's theory of a case or supports the defendant's theory of the case. This is the judicial approach to assessing truth and dispensing justice. This either/or

necessary that the expert's opinion be generally accepted as well." *Id.* at 567. The court went on to say:

> "[A] jury must be allowed to make credibility determinations and weigh conflicting evidence in order to decide the likely truth of a matter not itself initially resolvable by common knowledge or lay reasoning. . . . An expert's opinion need not be generally accepted in the scientific community before it can be sufficiently reliable and probative in support of a jury finding."

Id. at 567 (quoting Osburn v. Anchor Lab., Inc., 825 F.2d 908, 915–16 (5th Cir. 1987)).

269. *See id.* at 562.

270. *See In re* Paoli R.R. Yard PCB Litig., 35 F.3d 717, 755 (3d Cir. 1994), *aff'd in part and rev'd in part*, 221 F.3d 449 (3d Cir. 2000).

271. *See id.* at 758.

272. *See id.* at 758–59.

273. *See* Beecher-Monas, *supra* note 102, at 1094.

scenario achieves the goals of the civil justice system by creating confidence in a judicial decision based upon an existing controversy between two competing parties. In essence, there is a determination, ranging from supposition to actual, that one party is right and another is wrong.

In the scientific community, the standard of certainty regarding scientific testimony or evidence is premised upon probabilistic evaluation as opposed to either/or decisions.[274] In fact, scientists accept a larger degree of uncertainty in their studies because they acknowledge that uncertainty is inevitable.[275] Also, scientists accept that uncertainties do not invalidate studies, whereas judges wedded to the ontological view may find it disconcerting to fail in deducing causal connections because of stalwart reliance on traceability or linearity theories. In addition, the scientist's confidence interval measures are not consistent with the judicial view of sufficient probability to meet the legal preponderance standard. The former is the scientist's conservative posture taken to avoid claiming an association where there is none. The latter is the judge's choice as to which party's theory is more believable. The scientist is not concerned with choosing between two parties based upon believing one over the other; rather, the scientist expends effort to assess all available data for the purpose of determining how frequently exposure would be associated with disease as a matter of chance.[276]

By combining the standard for legal certainty with scientific principles of certainty, courts require a higher standard for validity of the testimony than scientists would because, at least in toxic tort cases, courts have limited scientific testimony on the general causation prong of factual causation to epidemiological studies.[277] Courts support this limitation by asserting that only epidemiological studies comport with legal certainty; however, scientists routinely employ various methods in their studies. As well, limiting scientific evidence or testimony in the name of achieving legal certainty ignores the scientist's very acceptance of uncertainty as inevitable in the test of truth through scientific research and replication of an observed event.

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274. *Id.* at 1097–98.
275. *Id.*
276. *See* FRIEDMAN, *supra* note 149, at 172–73.
277. *See* Beecher-Monas, *supra* note 102, at 1100–03.

Combining the standard for legal certainty with medical principles of diagnosis and treatment is even more controversial. The goal or objective of a medical professional is to treat or prevent injury.[278] Thus, the medical professional is less concerned with an either/or determination. Instead, the medical professional seeks to reject causes for a disease or injury, through differential diagnoses, to arrive at an immediate and effective course of treatment for a patient. During these efforts, the medical professional considers a range of causes and tests these causes for purposes of treatment before excluding them as potential sources of disease or injury.[279] The standard for legal certainty would be offended by requiring a jury to test potential causes for disease, one of which may be exposure to a toxin, before deciding which it believed was the source that caused plaintiff's injury. Thus, applying the legal standard of certainty to medical professionals also appears inconsistent with the methods and practices of that discipline. A medical professional should not be required to demonstrate that exposure to a toxin was the specific cause of a toxic tort plaintiff's injury; rather, the medical professional should be responsible for explaining the differential diagnoses and the potential or possible causes of the injury. Further, the toxic tort plaintiff should not be penalized unjustly for the inherent uncertainty of medical diagnoses.

These diagnoses should be admissible as support for plaintiff's theory of the case on the specific causation prong of factual causation, so long as such diagnoses are based on medically valid techniques or methodologies. Thus, so long as the medical professional performed the diagnosis using standard techniques recognized in the medical community, his causal inferences should be admitted, and his opinions should be weighed by the jury as a matter of credibility.[280]

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278. *See* Earl v. Cryovac, 772 P.2d 725, 727 (Idaho Ct. App. 1984).

> In scientific research, where the replication of an observed event is the ultimate test of truth, the usual standard of [causal association] is a high degree of [scientific] certainty. Conversely, in diagnosis and treatment of a specific patient, where the objective is to find a cure or to prevent further harm, a doctor may ascribe causal significance to a possibility that falls short of a [legal] probability.

Id.

279. *See In re* Paoli R.R. Yard PCB Litig., 35 F.3d 717, 755–56 (3d Cir. 1994), *aff'd in part and rev'd in part*, 221 F.3d 449 (3d Cir. 2000).

280. *See id.* at 758. Judge Becker stated:

Regardless of the differing goals and objectives of these three communities, and even court recognition of the inequity in applying legal certainty standards to scientific and medical certainty standards, these same courts seem unwilling to change the paradigm to better reflect the principles supporting each of the three disciplines. For example, in *Sterling v. Velsicol Chemical Corp.*,[281] the Sixth Circuit acknowledged that "numerous jurisdictions have rejected medical experts' conclusions based upon a 'probability,' a 'likelihood,' and an opinion that something is 'more likely than not' as insufficient medical proof."[282] The court also noted that "Tennessee courts have adopted a far less stringent standard of proof and have required only that the plaintiffs prove a causal connection between their injuries and the defendant's tortious conduct by a preponderance of the evidence."[283] Thus, "plaintiffs' proof by a reasonable medical certainty requires them only to establish that their particular injuries more likely than not were caused by ingesting contaminated water, and their proofs may be neither speculative nor conjectural."[284] The Sixth Circuit, like other courts, commingled the standard for legal certainty with that of medical professionals without considering that the standards are not mutually exclusive nor subject to disciplinary cross-pollination. The Sixth Circuit further stated that "[m]edical testimony that ingesting contaminated water 'possibly,' 'may have,' 'might have,' or 'could have' caused the plaintiffs' presently ascertainable or anticipated injuries does not constitute the same level of proof as a conclusion by a reasonable medical certainty."[285] Un-

> [A]lthough differential diagnosis is a generally accepted technique, no particular combination of techniques chosen by a doctor to assess an individual patient is likely to have been generally accepted. But unlike a methodology used in conducting a scientific study, lack of general acceptance is not a sign of unreliability, it is merely a result of the fact that the medical community will rarely have considered the reliability of a particular process of differential diagnosis used in an individual case. Nor is it likely that the particular combination will have been published and subject to peer review, because a particular version of differential diagnosis will rarely be of general interest to the medical community.

Id. As Judge Becker observed, the admissibility standards for scientists and physicians necessarily must be different and, therefore, it would be consistent to assign different certainty standards for scientists and physicians.

281. 855 F.2d 1188 (6th Cir. 1988).

282. *Id.* at 1201.

283. *Id.*

284. *Id.*

285. *Id.*

fortunately, as a practical matter, the latter terms are a more consistent representation of the causal inferences drawn by medical professionals on the specific causation prong of factual causation.[286] Thus, when courts adopt the reasonable medical certainty approach, they still require the plaintiff to meet a heightened standard of proof because physicians are called upon to satisfy le-

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286. *Cf.* Cottle v. Superior Court, 5 Cal. Rptr. 2d 882 (Cal. Ct. App. 1992). In *Cottle*, approximately 175 owners and renters of residential properties sued various defendants for personal injuries and property damages as a result of defendants' construction and development of that property subdivision on a site that had been used previously as a dumping ground for certain oil industry hazardous waste and other byproducts. *Id.* at 883. Plaintiffs presented expert medical testimony on the specific causation prong of factual causation in an in limine show cause hearing. *Id.* at 884. The trial judge excluded the testimony of plaintiffs' expert witnesses, because he found in his view:

> "after reading the . . . prima facie showings . . . there is no witness or witnesses who can testify, that I know of—none have been presented to me—that any hazardous or toxic substance has, to a reasonable medical probability, a certainty or anything beyond the most tenuous possibility caused any illness in any plaintiff or injured or exacerbated any injury."

Id. at 886.

One medical expert testified that plaintiffs' medical conditions "'could possibly be partially due to and/or exacerbated by continuous exposure' or 'could possibly be [or have been] exacerbated by continuous exposure' to chemical substances." *Id.* at 893. While another physician testified that "similar problems 'have been associated with,' 'could be directly related to effects of,' 'may occur in children as a result of,' and 'may be related to' [chemical] exposure." *Id.* at 894. The trial judge was not convinced that the testimony by these experts met the reasonable medical probability standard, even though the trial judge did not distinguish between scientific experts and medical experts. *Id.* at 893. In describing reasonable medical probability, the trial judge stated:

> "The law is well settled that in personal injury action causation must be *proven within a reasonable medical probability based upon competent expert testimony*. Mere possibility alone is insufficient to establish a prima facie case. . . . That there is a distinction between a reasonable medical 'probability' and a medical 'possibility' needs little discussion. There can be many possible 'causes,' indeed, an infinite number of circumstances which can produce an injury or disease. A possible cause only becomes 'probable' when, in the absence of other reasonable causal explanations, it becomes more likely than not that the injury was a result of its action. This is the outer limits of inference upon which an issue may be submitted to the jury."

Id. at 892 (quoting Jones v. Ortho Pharm. Corp., 163 Cal. App. 3d 396, 402–03 (1985)).

A court's insistence that a physician perform a differential diagnosis to meet the reasonable medical certainty standard is very different from the insistence that a physician exclude other reasonable explanations. It is the existence of other reasonable causal explanations that makes it impossible for a physician in good standing to choose one reasonable causal explanation over another. A court's insistence on the definitive exclusion of other reasonable causal explanations places an extra and heightened burden on the toxic tort plaintiff trying to establish the specific causation prong of factual causation. The nature and purpose of the medical profession and its reliance on differential diagnosis is to narrow the causes, sometimes to a few or even the one possible cause. These reasonable possibilities are the exact phenomena that treating physicians face when presented with an individual patient, and it should be these possibilities that are accounted for in a certainty standard tailored to meet the exigencies of the physician's discipline.

gal standards of certainty, which do not comport with medical certainty.

C. *Legal Sufficiency and Factual Causation*

Legal sufficiency and admissibility are not mutually exclusive standards in a toxic tort case.[287] The misunderstood relationship between legal sufficiency and admissibility can be traced to the confusion between evidentiary reliability standards and quantum of proof requirements. This misunderstanding and confusion can result in irreparable damage to the plaintiff's case. Reliability testing involves the admissibility of expert testimony, while the quantum of evidence involves the sufficiency of plaintiff's body of proof.[288] An inquiry regarding the sufficiency of the evidence concerns whether the party has produced sufficient evidence, or enough evidence, to convince a reasonable juror that the opinion of the party's expert is correct.[289] A legal sufficiency review should consider, synergistically, all of the evidence.[290] In contrast, "[a]dmissibility entails a *threshold* inquiry over whether a certain piece of evidence ought to be admitted at trial."[291]

Confusion in the application of standards is also attributable to the types of evidence required to prove factual causation in toxic tort cases. Steve Gold explains that reliance on statistical evidence is a necessity for proving the general causation prong of factual causation because of the inherent difficulties in uncovering direct proof of causal links between exposure and injury.[292] The reliance on statistics and probabilities as opposed to direct, individual observation creates disparities in the application of standards and burdens.[293] Gold states:

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287. *See In re* Joint E. & S. Dist. Asbestos Litig., 52 F.3d 1124, 1132 (2d Cir. 1995) ("The 'admissibility' and 'sufficiency' of scientific evidence necessitate different inquiries and involve different stakes.").

288. *See* Berry v. CSX Transp., Inc., 709 So. 2d 552, 568 (Fla. Dist. Ct. App. 1998).

289. *Id.*

290. *See* Jennifer Murray, Note, *Reformation Of The Legal Sufficiency Standard For Expert Testimony: Expert Testimony Must Be Reliable And Epidemiological Evidence Must Show Double The Risk:* Merrell Dow Pharm., Inc. v. Havner, 40 TEX. SUP. CT. J. 846 (July 9, 1997), 29 TEX. TECH. L. REV. 251, 261 (1998).

291. *Id.* (citing *Joint E. & S.*, 52 F.3d at 1132).

292. *See* Gold, *supra* note 226, at 380.

293. *Id.* at 380–81.

> Because toxic tort plaintiffs and defendants rarely can introduce "particularistic" evidence, which directly addresses the issue of causation in the individual case, causation can not properly be formulated as a yes-or-no fact. Rather, the parties can show an increased risk or enhanced probability of disease that results from defendant's conduct or from other, non-defendant causes. Thus, in toxic torts the causation inquiry is reduced to questions of the existence and magnitude of a fact probability.
>
> Courts and commentators have responded to this situation by collapsing the burden of proof and the standard of persuasion into a single test. The blurring of fact and belief probability conflates the two aspects which describe the plaintiff's task—the definition of the fact or element to be proven ("burden"), and the amount of credence which must be given to that fact in order to support a finding ("standard"). Typically, the "collapsed" test is expressed in shorthand, i.e., "plaintiff must show that causation is more likely than not" . . . [where] "more likely than not" . . . refer[s] to belief probability.[294]

Gold's assessment of the collapsing of fact probability and belief probability is consistent with recent toxic tort jurisprudence. For example, *Merrell Dow Pharmaceuticals, Inc. v. Havner* typifies this collapsing as represented by the reviewing court's decision that reasonable minds could not differ on the general causation prong in spite of plaintiffs' expert testimony and a jury verdict for plaintiffs.[295] In expressing an opinion about the correctness of plaintiffs' expert's opinion, under the guise of a reliability determination, the *Havner* court conflated fact probability with belief probability and ultimately usurped the jury's role as arbiter of credibility, weight, and persuasion of all admissible evidence.

As articulated by Gold, courts and some commentators are not making distinctions between the burden of production of evidence[296] on the element of factual causation and the burden of persuasion.[297] The burden of production of evidence is of great importance in determining the legal sufficiency of evidence presented by the party pleading the existence of the fact, because the burden requires the plaintiff to bring forward a quantum of admissible proof. The party establishing the existence of the fact

294. *Id.* at 384–86.

295. *See* discussion *supra* Part II.B (concerning Merrell Dow Pharm., Inc. v. Havner, 953 S.W.2d 706 (Tex. 1997)).

296. *See* Gold, *supra* note 226, at 378–81.

297. *Id.*

may do so by presenting direct or circumstantial evidence.[298] In toxic tort cases, direct evidence of a causal nexus between a defendant's product or agent and plaintiff's exposure injury is rarely available; thus, plaintiffs must rely primarily on circumstantial evidence to meet both admissibility and legal sufficiency standards. In order for circumstantial evidence to satisfy the burden of production, the evidence must be more than a scintilla.[299] The evidence must be such that a reasonable person could draw from it the inference of the existence of the particular fact to be proved,[300] with that evidence and inference being viewed in a light most favorable to the nonmoving party, usually the plaintiff.[301]

But when the evidence is circumstantial, forensic disputes often arise as to its sufficiency to warrant a jury drawing the desired inference.[302] Courts in civil cases have stated that the burden of producing evidence is satisfied, even by circumstantial evidence, if there are sufficient facts for the jury to reasonably conclude that the preponderance favors liability.[303] A judge is

298. *See* Herrington v. Leaf River Forest Prods., Inc., 733 So. 2d 774, 777 (Miss. 1999) ("Circumstantial evidence consists of 'evidence of a fact or a set of facts, from which the existence of another fact may reasonably be inferred.'" (citations omitted)).

299. *See* Daubert v. Merrell Dow Pharm., Inc., 509 U.S. 579, 596 (1993) ("[I]n the event the trial court concludes that the scintilla of evidence presented supporting a position is insufficient to allow a reasonable juror to conclude that the position more likely than not is true, the court remains free to direct a [verdict] . . . [or] grant summary judgment."). The Supreme Court, in the opinion delivered by Justice Blackmun, does not require that the plaintiff persuade the trial judge that her factual theory of the case on the issue of factual causation is correct. *Id.* at 595. Instead, the trial judge only requires the plaintiff to produce a body of evidence that can be reviewed to determine if there is a sufficient quantum of proof to cause a reasonable juror to exercise belief probability in favor of plaintiff's theory. *Id.* If a reasonable juror could express belief probability in plaintiff's theory, then the matter falls within the province of the trier of fact. *See id.* In essence, the trial judge who draws her own opinion about the correctness of plaintiff's theory must ask herself if the quantum of evidence supports an alternate belief that could be held by another.

300. *Id.*

301. *Id.*

302. *See* Gold, *supra* note 226, at 381 n.22 (citing CHARLES T. MCCORMICK, MCCORMICK ON EVIDENCE §§ 337–40 (Edward W. Cleary ed., 3d ed. 1984) [hereinafter MCCORMICK]).

303. *See, e.g.*, *In re* Joint E. & S. Dist. Asbestos Litig., 52 F.3d 1124, 1126 (2d Cir. 1995); *see also* Gold, *supra* note 226, at 381 (arguing that judges presiding over criminal cases should be rigorous in their role as gatekeeper on issues of admissibility of expert testimony and legal sufficiency). Gold's view is consistent with providing leeway for toxic tort plaintiffs for at least two reasons. First, the stakes are much higher for an accused in criminal cases than for institutional defendants in civil toxic tort cases. Second, the party typically in a vulnerable position in toxic tort cases is the plaintiff, not the defendant. Therefore, any substantive and procedural safeguards created because of relaxed stan-

guided in the sufficiency determination by common sense, experience, and opinion as to the limits of reasonable inference from the facts proven.[304] At this stage, the party pressing the toxic tort claim is seeking only to survive a motion for summary judgment on the issue of the sufficiency of the expert testimony.[305] This stage is critical to toxic tort plaintiffs because it marks the point at which a judge is faced with the pivotal decision whether to review the amount of admissible evidence, not the specific type, to conclude, after a synergistic review, that there exists a genuine issues of material fact.[306] Unfortunately, the unwary trial judge can render a decision about the correctness of the plaintiff's expert testimony or evidence on the factual causation element if he cannot separate the gatekeeping role for the admissibility of a specific type of evidence from the conventional procedural role, dependent on common sense, that enough evidence exists to ordain the presence of a factual controversy between two parties.[307]

As previously mentioned, reliance on circumstantial evidence in a toxic tort case is undeniable because causal relationships between agent, exposure, and disease are not susceptible to direct proof.[308] The amount and degree of circumstantial evidence that will satisfy the test for legal sufficiency at the summary judgment stage is contingent upon the court's decision to apply minimal requirements for sufficiency,[309] stringent requirements for sufficiency,[310] or some middle ground between the two approaches.

The minimal requirements standard for legal sufficiency is ex-

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dards of legal sufficiency and admissibility in civil cases should inure to the plaintiff so long as these safeguards result in equitable treatment of the litigating parties.

304. *See* MCCORMICK, *supra* note 302, § 339.

305. *See, e.g., Joint E. & S.*, 52 F.3d at 1124.

306. *See id.* In an action involving workplace exposure to asbestos-containing products, the district court found that plaintiff's epidemiological evidence failed to satisfy the sufficiency requirements, i.e., Bradford Hill "Standardized Mortality Ratio" (SMR) factors employed to make a causal assessment of the association between an agent and disease; and, thus, the evidence on the general causation prong was insufficient. *Id.* at 1128. The Second Circuit concluded that the district court "impermissibly crossed the line from assessing evidentiary reliability to usurping the role of the jury." *Id.* at 1131. Accordingly, the Second Circuit reversed the district court's grant of defendant's motion for directed verdict that came subsequent to a jury verdict in favor of plaintiff. *Id.*

307. *See id.* Trial judges must avoid rendering "independent assessments of witnesses' conclusions and comparative credibilities" so as not to surpass the *Daubert* limit of evaluating evidentiary reliability. *Id.* at 1133.

308. *See* Callahan, *supra* note 50, at 617.

309. *See* BOSTON & MADDEN, *supra* note 15, at 368–89.

310. *Id.*

plained in *Ferebee v. Chevron Chemical Co.*,[311] where each party's expert presented contrary testimony on the issue of factual causation in an herbicide exposure case in which plaintiff alleged that he contracted pulmonary fibrosis.[312] The court, in its decision to apply the minimal requirements standard for legal sufficiency, stated:

> 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 the testimony.
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> ....
>
> . . . Thus, a cause-effect relationship need not be clearly established by animal or epidemiological studies before a doctor can testify that, in his opinion, such relationship exists. As long as the basic methodology employed to reach such a conclusion is sound, such as the use of tissue samples, standard tests, and patient examinations. . . . In a courtroom, the test for allowing a plaintiff to recover in a tort suit of this type is not scientific certainty but legal sufficiency; if reasonable jurors *could* conclude from expert testimony that [exposure] more likely than not caused [plaintiff's] injury, the fact that another jury might reach the opposite conclusion or that science would require more evidence before conclusively considering the causation question resolved is irrelevant.[313]

The minimal requirements standard for legal sufficiency may appear to relieve the judge from the difficult task of evaluating the reliability of expert testimony and the validity of techniques and methodology, but in fact it does not. The judge retains the responsibility to determine the admissibility of expert testimony.[314] In addition, the judge remains responsible for deciding if evidence presented by both parties is legally sufficient, based upon com-

311. 736 F.2d 1529 (D.C. Cir. 1984).

312. *Id.* at 1533.

313. *Id.* at 1534, 1535–36. The *Ferebee* court did not require a legal sufficiency determination to rest on a specific scientific or medical test. This inclusive approach to the quantum of evidence that will satisfy legal sufficiency is consistent with the scientist's approach of considering various studies before completing a study and expressing an opinion about the results of that study.

314. *See id.* at 1535; Reed v. State, 391 A.2d 364, 367–68 (Md. 1978) ("[The] court has held that the determination of similar and related issues [of expert testimony] are generally matters within the sound discretion of the trial court.").

mon sense, experience, and opinion, to create a genuine issue of material fact.[315] What is not required of the judge is an evaluation of the credibility or the correctness of an expert's opinion when that expert's testimony is reliable and his methodology is sound.[316]

The stringent requirement for legal sufficiency is expressed in *Brock v. Merrell Dow Pharmaceuticals, Inc.*,[317] where the reviewing court entered a judgment notwithstanding a verdict in favor of defendants.[318] The Fifth Circuit, in deciding that plaintiff's expert's testimony was insufficient, determined that the number of epidemiological studies[319] presented by the defendant demonstrated that the relative risk[320] produced from the study did not support the proposition that exposure to defendant's product, Bendectin, caused birth defects.[321] Plaintiff presented the testimony of an expert who conducted re-analysis on the leading epidemiological study and concluded that Bendectin is a human teratogen and is capable of causing birth defects, including limb reduction defect.[322]

The Fifth Circuit panel viewed the definitions for legal sufficiency and other procedural principles as "general and abstract formulations [that] lose much of their usefulness, . . . when we at-

315. *See* MCCORMICK, *supra* note 302, § 339.

316. *Ferebee*, 736 F.2d at 1535; *see Reed*, 391 A.2d at 367–68.

317. 874 F.2d 307 (5th Cir. 1989).

318. *See id.* at 308–09.

319. Resorting to the numbers of epidemiological studies is reminiscent of the *Frye* general acceptance test that compared the number of experts willing to ascribe to one view as opposed to an alternative, contrary view and giving credence to the position supported by more studies. Frye v. United States, 293 F. 1013, 1014 (D.C. Cir. 1923). In *Brock*, the role of the judge should have been limited to exercising his common sense, experience, and opinion on the sole issue of the existence of a genuine issue of material fact presented by experts with contrary opinions, yet adequately sound methods supporting their opinions. *See* MCCORMICK, *supra* note 302, § 339.

320. Relative risk is defined as the ratio of the rate of incidence of a disease among those exposed to the disease as compared to the rate of those not exposed to the disease. *Brock*, 874 F.2d at 312. Relative risk determines the chance that a segment of the exposed group will or will not contract a disease. *Id.* Incidence rates are the primary measure of disease in a population. Incidence rates compare the number of people developing new cases of disease within a population in a given time period with the total number of people exposed to the risk of developing the disease in a given time period. *See* TIMMRECK, *supra* note 23, at 141–45.

321. *Brock*, 874 F.2d at 309.

322. *Id.* at 314–15.

tempt to apply them to concrete factual situations."[323] The court stated:

> The first problem is that there is often no consensus in the medical community regarding whether a given substance is teratogenic; this is the case with Bendectin. Moreover, while we now recognize some of the many factors which can cause birth defects, medical science is now unable, and will undoubtedly remain unable for the foreseeable future, to trace a known birth defect back to its precipitating cause. The second problem, in addition to the problem of unknowability, is that juries are asked to resolve these questions, upon which even our brightest medical minds disagree, in order to resolve the case at hand and decide whether the plaintiff is entitled to recovery, and in so doing must necessarily resort to speculation.
>
> ... Confronted, as we now are, with difficult medical questions, courts must critically evaluate the reasoning process by which the experts connect data to their conclusions in order for courts consistently and rationally to resolve the disputes before them. Moreover, in mass torts the same issue is often presented over and over to juries in different cases, and the juries often split both ways on the issue. The effect of this is to create a state of uncertainty among manufacturers contemplating the research and development of new, and potentially life saving drugs. Appellate courts, if they take the lead in resolving those questions upon which juries will go both ways, can reduce some of the uncertainty which can tend to produce a suboptimal amount of new drug development.[324]

The court's use of the stringent standard for legal sufficiency increasingly enforces the paternalistic view that the jury is incapable of asserting a rational conclusion about the credibility of the experts and using common sense and experience in its weighing of evidence. Courts relying on the stringent standard for legal sufficiency create the fiction that they are in a better position to evaluate and decide complex scientific issues, even when such issues are purely fact based. In essence, these same courts are usurping the province of the jury to assess the credibility and weight of admissible evidence to arrive at a belief supported by the available facts.

The Fifth Circuit also assumed, without reason, that verdicts must be consistent when toxic tort issues are similar.[325] Because two juries might decide a case differently is not support for con-

323. *Id.* at 309.
324. *Id.* at 309–10.
325. *Id.* at 309.

verting the standard for legal sufficiency into one of admissibility or persuasion as a matter of law before reaching the trier of fact. Accordingly, where the scales of justice are already severely bent in favor of defendants, the minimal standard of legal sufficiency should be adopted when evaluating evidence of factual causation.

D. *Preponderance of Evidence and Factual Causation*

Preponderance of the evidence is traditionally characterized as the requirement to demonstrate that the facts more likely than not prove the existence of causation.[326] "[T]he phrase [preponderance of the evidence] does not simply mean volume of evidence or number of witnesses."[327] The preponderance is evinced by the trier of fact's belief that the existence of the contested fact is more probable than its nonexistence.[328]

In virtually every case, plaintiffs carry the burden of proof on the factual causation element.[329] The defendant is not required to disprove factual causation.[330] Instead, a defendant need only challenge the evidence presented by the plaintiff using the conventional litigation devices of "vigorous cross-examination, presentation of contrary evidence, and careful instruction on the burden of proof" (persuasion).[331] The plaintiff must present a theory of the case, supported by evidence and testimony, which can withstand defendant's use of conventional litigation devices to oppose a finding of sufficiency.[332] If a plaintiff withstands these challenges, the trial court must conclude that the case is ripe for jury consideration, after which plaintiff must be prepared to carry the burden of persuasion.[333] The burden of persuasion measures a jury's belief about the facts and inferences to be drawn from the complete body of evidence presented by parties.[334] After weighing each party's version of the relative truth, the jury is called upon to de-

326. *See* MCCORMICK, *supra* note 302, § 339.
327. *Id.*
328. *Id.*
329. *Id.* § 337; *see* Callahan, *supra* note 50, at 605.
330. MCCORMICK, *supra* note 302, § 337.
331. *See* Daubert v. Merrell Dow Pharm., Inc., 509 U.S. 579, 596 (1993).
332. *See id.*
333. *See id.*; MCCORMICK, *supra* note 302, §§ 337–40.
334. *See* GRAHAM C. LILLY, AN INTRODUCTION TO THE LAW OF EVIDENCE 54–60 (3d ed. 1996).

cide which party's version of the controversy represents the probable truth.[335]

As current federal case law has heightened the standard for admissibility of expert testimony, toxic tort case law has also heightened the standard for believability. Despite the higher preponderance standard measuring believability in toxic tort cases, judges remain vested with the discretion to try to correct the imbalance in the burdens shouldered by toxic exposure plaintiffs. Judges may allocate burdens to account for social or public policy considerations. Judges who ignore the apparent imbalance between toxic exposure plaintiffs on the one hand and defendants on the other typically follow the strong preponderance rule for truth probability.[336] Those judges aware of the inherent imbalances between toxic tort litigants typically follow the weak or minimal preponderance rule for truth probability.[337]

The strong preponderance standard employs an all-or-nothing approach, where the toxic exposure plaintiff is compensated only after persuading the trier of fact that her entire claimed injury was the consequence of a defendant's tortious act.[338] This standard is poorly suited for toxic tort litigation and its factual causation element because most exposures to harmful toxins cannot be isolated with precision from background risks.[339] Thus, if the trier of fact believes that a plaintiff's harm is less than the fifty-one percent believability ratio, she will not be compensated for the percentage of harm that is actually attributable to her exposure.[340] For this reason, the strong preponderance standard works a double hardship on toxic exposure plaintiffs who may also be in a jurisdiction that requires meeting a heightened standard for legal sufficiency prior to reaching the trier of fact.[341]

The more equitable and preferable standard to apply in toxic tort cases is the weak or minimal version of the preponderance

335. MCCORMICK, *supra* note 302, § 339.

336. *See* Callahan, *supra* note 50, at 605, 611.

337. *See id.* at 611.

338. *Id.* at 610, 611 (citing Jackson v. Johns-Manville Sales Corp., 727 F.2d 506, 516 (5th Cir. 1984)).

339. *Id.* at 617.

340. *Id.* at 611.

341. *Id.* at 610–12.

rule.[342] This version of the preponderance standard allows the judge to set a baseline standard of the quantum of proof that would satisfy the factual causation element alone.[343] In setting this baseline, a standard necessarily lower than the heightened standards currently in existence for legal sufficiency, the judge communicates to the trier of fact that the amount of proof presented by plaintiffs is adequate to begin assessing believability. Under the minimal version of the preponderance standard, the judge may also consider shifting the burden of believability of certain facets of the factual causation element—for example, the general causation prong of any of the three factual causation tests—to defendants. Such a shifting is supported by the proposition that defendants are in a better position to meet the burden of non-persuasion on the general causation prong of the factual causation element because defendants are usually the custodians of information about the harmful effects of a toxin or its byproduct.

Regardless of the measures taken to achieve balance in an inherently inequitable area of the law, defendants will not become disadvantaged so long as these balancing measures continue to allow presumptions favoring toxic exposure plaintiffs to be rebutted by defendants during the believability phase of litigation.

IV. CONCLUSION

Factual causation in toxic tort litigation can be considered either overwhelming to the common law tort system, particularly trial courts vested with the gatekeeping responsibility over scientific and medical expert testimony and evidence, or no different than traditional tort cases. Under current principles of toxic tort jurisprudence, many courts and commentators view the element of factual causation as an insurmountable obstacle to recovery for those injured from alleged toxic exposure. Meeting admissibility, certainty, and sufficiency standards need not be insurmountable so long as the goals of the tort system remain intact and conventional litigation devices are used for the purpose of achieving balance and equity for toxic exposure plaintiffs.

Before deciding to throw out the baby with the bath water, ju-

342. *Id.* at 611–12.
343. *Id.* at 611.

risprudence should reflect on the philosophy of causation in the law and the philosophy of causation in modern science. Distinguishing between the two disciplines will assist judges in developing a construct or schema to compartmentalize the theories of causation across disciplines. Understanding that factual causation has a unique meaning and set of standards in each distinct discipline will yield an appreciation of the significance that the term holds in various disciplines. The legal discourse community cannot continue to stunt the growth of the term causation by holding it captive in a purely ontological model. As has been demonstrated by the insurgence of vexing and perplexing problems arising from toxic tort litigation, the legal ontologist's standards for causation are constantly being challenged and are continuously being *reductio ad absurdum.*

Administrative or legislative solutions to ameliorate the imbalances presented by sprays of inconsistent jurisprudence are slow on the horizon. Furthermore, judicial ontological activism, absent considerations of equity and public policy, threatens the framework of the adversarial system in toxic tort civil litigation. Toxic exposure plaintiffs are due an equitable balancing in this area of the law. This balancing can be achieved by treating each discipline's method for establishing causation with the proper deference and scope and by recognizing the importance of the goals and objectives that each pursues. Judicial epistemology in the law of causation achieved many successes for the tort system. It will be the reliance on these same epistemological policies, coupled with ontological principles, that will strike a fair balance of protections between those who manufacture and promote the use of toxic products and those individuals harmed by exposure.

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