Toxic Tort Litigation and the Causation Element: Is There Any Hope of Recognition

Ora Fred Harris Jr.
TOXIC TORT LITIGATION AND THE CAUSATION ELEMENT: IS THERE ANY HOPE OF RECONCILIATION?

by

Ora Fred Harris, Jr.*

[T]his new kind of harm fails to fit into the mold of a traditional common law tort. Rules and causes of action that developed from traditional, individualized wrongs do not allow recovery by toxic waste victims.1

THE above view quite adequately places in proper perspective the dilemma that has surfaced today in trying to reconcile the hitherto little understood toxic or hazardous waste exposure injury2 with the principles and goals underlying traditional common law tort liability. The singular nature of a toxic tort injury with its inherent problems of latency and causal indeterminacy3 wreaks havoc with establishing the fault of a specific individual or corporate entity and presents well-nigh insuperable problems in demonstrating the requisite causal relationship between exposure to a hazardous waste or toxic substance and a victim's subsequent injury.4 In view

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* B.A., J.D., University of Arkansas at Fayetteville. Professor of Law, University of Cincinnati College of Law.

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2. A vast amount of scientific uncertainty envelops the question of the manifestation of injuries resulting from exposure to hazardous waste or toxic substances. See, e.g., Note, Tort Actions for Cancer: Deterrence, Compensation, and Environmental Carcinogenesis, 90 YALE L.J. 840, 840 (1981) (in the case of cancer, a dreaded, widely researched disease, the actual etiology is scientifically uncertain).


When the onset of the disease or injury is latent (delayed), predictions of future incidence are based on statistical possibilities. When, in addition, the biological causal relationship also is non-specific (it may be caused by radiation but also arises among unexposed groups and no differentiation between those cases caused by radiation and those caused otherwise is possible), the legal problems, difficult before, become unmanageable under existing rules.

Id.; see also Elliott, Goal Analysis Versus Institutional Analysis of Toxic Compensation Systems, 73 GEO. L.J. 1357, 1372 (1985) (problem is not only scientific uncertainty but also sheer number of small contributors to total risk so that matching particular exposures to particular diseases is impractical).

of this untenable situation, questions regarding the prudence of reforming the traditional tort liability system to make it responsive to the peculiar demands of this "new" toxic tort have arisen. These modifications have been examined from a policy, an economic, and even an insurance point of view.

This Article focuses primarily upon the possible ramifications that any tinkering with the current tort system may have on the venerable policy objectives of tort law: compensation, deterrence, and corrective justice. In this connection, this Article basically presents an analysis of some possible adjustments to the causation element, the satisfaction of which is normally a condition precedent for recovery under any of the commonly recognized tort theories such as negligence, nuisance, trespass, strict liability, or strict products liability. The inquiry is aimed at formulating a thesis of causation that will augment the toxic waste exposure victim's chances of compensation and will, at the same time, foster the fulfillment of the other two traditional objectives of tort law, deterrence and corrective justice. Through this process the Article attempts to develop a causation theory that is consistent with the dynamics of modern toxic tort litigation. Moreover, the Article offers and explores a proposal regarding the proper forum and scheme for interposing this causation model into toxic tort cases.
I. HISTORICAL BACKGROUND OF THEORIES OF RECOVERY FOR TOXIC OR HAZARDOUS EXPOSURE INJURIES: THE CAUSATION PROBLEM

Within the pale of traditional tort liability analysis four theories readily come to mind when considering the possible avenues available for toxic or hazardous waste exposure victims to recover damages for their injuries. These actions may be grounded upon nuisance, trespass, negligence, strict liability or strict products liability. Each theory is fraught with difficulty in the toxic tort context for a number of reasons; most notably, the causation component of each theory of action is a common conundrum.

Regardless of the theory of recovery employed, the exposure victim has to establish, with varying degrees of difficulty, that the defendant's conduct was a cause-in-fact of the plaintiff's injury. The plaintiff must demonstrate cause-in-fact on a more probable than not basis, that is, the plaintiff must show a probability of causation in excess of fifty percent. Furthermore, the cause-in-fact must comport with either the "but for" test or the "substantial factor" test. The plaintiff must prove by the preponderance of the evidence that "but for" the defendant's conduct, the plaintiff would not have been injured or, alternatively, that the defendant's conduct was a substantial factor in bringing about the plaintiff's injury. The common law thus requires that the plaintiff establish causation with reasonable certainty and specificity; should the plaintiff fail to do so by the greater probability, he or she will recover no recompense for any injuries.

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13. For an illuminating discussion of the proof problems attendant to trespass, nuisance, negligence, and strict liability see Note, supra note 9, at 122-38. Because strict liability dispenses with the requirement of proving fault, it is championed by some commentators as a progressive approach to adopt in toxic tort liability cases. See id. at 129-31.

14. The causation-in-fact element scrutinized in this Article should not be confused with the concept of proximate cause, which has nothing to do with causal relationship, but is simply a policy-based concept used to keep the scope of tort liability within reasonable bounds. Causation-in-fact (hereinafter interchangeably used with the word "causation") concerns, for the most part, the factual relationship between cause and effect. See Malone, Ruminations on Cause-in-Fact, 9 STAN. L. REV. 60, 60 (1956). Another commentator has added a third distinct component to the causation formula: causal link. Calabresi, Concerning Cause and the Law of Torts: An Essay to Henry Kalven, Jr., 43 U. CHI. L. REV. 69, 71 (1975).

15. Rosenberg, supra note 6, at 858.


17. Quite frankly, in most factual circumstances, both tests are likely to produce the same results. Any act that was a "but for" cause was probably also a "substantial factor" in bringing about a particular result. See id. A notable exception may be those situations involving concurrent causes, either of which alone could have produced the result. The "but for" test is probably inappropriate in such situations. Id. § 41, at 239; see Anderson v. Minneapolis, St. P. & S. Ste. M. Ry., 146 Minn. 430, 179 N.W. 45 (1920) (two merging fires, one of unknown origin; only the substantial factor test was appropriate).

18. Those critics of the traditional common law rules concerning causation understandably have questioned whether the rules promote the venerable tort goals of compensation (the plaintiff may receive absolutely nothing for his or her injuries because of the all-or-nothing
Causation problems are greatly compounded when applied to the field of toxic or hazardous exposure injury. A common, generally accurate, evaluation of humankind's understanding of the behavior of hazardous or toxic wastes and the effect of exposure on humans points to a vast amount of scientific uncertainty. This uncertainty is understandable given that many of these issues are at the very frontiers of science. Thus, a plaintiff attempting to establish that exposure to a particular substance has in fact caused his or her injury may face a dubious court or jury because of the lack of scientific certainty. Moreover, because this "new" tort injury can have a latency period of up to as many as twenty to thirty years, it may be, as a practical matter, virtually impossible to establish the requisite causal relationship between an exposure that may have taken place many decades ago and a recently manifested injury now claimed to be the consequence of that exposure. Not only does this long latency period stymie the toxic or hazardous exposure victim's ability to isolate the alleged substance that precipitated the injury, it also diminishes the chances of identifying the responsible parties. These two requirements are critical if an injured plaintiff is to establish causation successfully in a toxic tort case. Because of this latency phenomenon and the causal indeterminacy that it spawns, traditional tort liability principles, which generally impose upon the plaintiff the burden of proving causation-in-fact by a preponderance of the evidence, simply serve as an impregnable barrier to recovery by an exposure victim. Stated more bluntly, traditional tort rules and analyses concerning causation are perhaps out of place when applied to toxic tort litigation.


22. Latency period means the interval between the time one is exposed to a toxic substance or hazardous waste and the time that an injury or disease manifests itself.


24. The responsible party, for example, may be unidentifiable because of the number of generators that may have used a particular waste site, all disposing of similar, if not identical, toxic or hazardous wastes. Moreover, the ownership and operation of these waste sites generally changes quite rapidly, making assignment of blame to any specific individual, group of individuals, or legal entity extremely difficult. See Note, Proving Causation in Toxic Torts Litigation, 11 HOFSTRA L. REV. 1299, 1301 (1983). "The burden of identifying the responsible party can be an impossible one to meet." Id.

25. See Note, supra note 1, at 580.
II. THE RISK OF EXPOSURE TO TOXIC SUBSTANCES OR HAZARDOUS WASTES

A. The Nature and Extent of the Risk

As the United States continues to develop economically, striking a proper balance between economic output and the quality of the environment becomes more profoundly significant. Most, if not all, Americans want a better standard of living; yet, this desire may require a trade-off in regard to maintaining a healthy environment. For example, a socially beneficial manufacturing or chemical process, which produces highly useful products and provides employment for a substantial number of people, may generate as a by-product a vast amount of toxic substances or hazardous wastes, which may pose a significant threat to human health and the environment. Moreover, these toxic substances or hazardous wastes may be disposed of improperly, thus exacerbating the risk of harm. To assist in comprehending the magnitude of the danger involved, note that “[e]xperts estimate that of the approximately 50,000 hazardous waste disposal sites in the country, between 1300 and 34,000 sites contain substantial amounts of hazardous wastes which could damage human health or the environment.”

With a human exposure risk problem of such mammoth proportions, the improper disposal of toxic and hazardous wastes is a national public health problem. This unpalatable situation costs the nation not only in environmental terms, but tends to drain our economic resources as well. A prime example of the massive economic investment that has been made in managing and controlling hazardous waste sites is the Superfund program. In this program Congress originally committed $1.6 billion for the emergency cleanup of hazardous waste sites whose actual or threatened releases create

26. The balancing of these countervailing considerations is always a major underpinning of environmental regulation and decision-making. See T. Schoenbaum, Environmental Policy Law 59-60 (1985).
27. Id. at 60 (“people argue that environmental disruption must be tolerated as a 'trade-off' to progress”). The Resource Conservation and Recovery Act, 42 U.S.C. § 6901(a)(2) (1982) states that:

[T]he economic and population growth of our Nation, and the improvements in the standard of living enjoyed by our population, have required increased industrial production to meet our needs, and have made necessary the demolition of old buildings, the construction of new buildings, and the provision of highways and other avenues of transportation, which, together with related industrial, commercial, and agricultural operations, have resulted in a rising tide of scrap, discarded, and waste materials.

28. One commentator noted that “[e]very year millions of tons of hazardous wastes are discarded into the environment.” Note, supra note 23, at 797.
29. Id. at 798.
30. “Perhaps 90 percent of these hazardous wastes, or 41 million tons, is being disposed of improperly.” Goldfarb, The Hazards of Our Hazardous Waste Policy, 19 Nat. Resources J. 249, 251 (1979).
32. For example, the etiology of “from 70 to 90 percent of all cancers” is said to be environmental factors. Id.
an imminent and substantial danger to human health and the environment. 34

In addition, staggering amounts of money have been expended in connection with administering and enforcing the various federal environmental statutes. 35

To date, this massive environmental threat and the concomitant economic commitment to counteract it show no sign of waning. 36 The most practical goal may be simply to stabilize the danger at its present level through the stringent enforcement of federal, and perhaps state, 37 environmental laws.

34. 42 U.S.C. §§ 9631-9633 (1982). Taxes on petroleum and certain chemicals initially comprised 85% of the fund, while penalties, certain amounts collected under the Federal Water Pollution Control Act, and Treasury appropriations comprise the remaining amount. Id. § 9631. $1.6 billion seemed grossly inadequate to deal effectively with the colossal problem of cleaning up hazardous waste sites. Recent proposals concerning reauthorization called for a Superfund of up to $10 billion, an amount palpably more reasonable than the $1.6 billion figure. See House Passes Superfund Reauthorization, THE WEEK IN CONGRESS, CONG. INDEX (CCH) (Dec. 13, 1985). An impasse developed, however, that threatened any meaningful congressional action, primarily because the Senate insisted upon a $7.5 billion Superfund program and partial funding of the program by a manufacturers' excise tax. Budget Bill Stalls Adjournment, THE WEEK IN CONGRESS, CONG. INDEX (CCH) (Dec. 20, 1985). As a result, final "action [remained] uncertain because of the difficulties conference committee members [had] in resolving differences between the House and Senate Bills." Dombrowski, Who Will Pay Hazwaste Cleanup Bill?, MGMT. OF WORLD WASTE, Feb. 1986, at 42. On October 2, 1986, however, House and Senate conferees agreed on a $9 billion, five-year Superfund program. Hanlon, Superfund Reauthorization Compromise Includes Oil Import Fee, 33 TAX NOTES, Oct. 6, 1986, at 13. "The majority of the revenues would come from a substantial increase in the Superfund petroleum taxes, combined with a broad-based tax on manufacturers. The conferees reimposed the prior law petroleum feedstock taxes . . . ." Id. In addition general revenues and "interest and cost recoveries from polluters" would be funding sources. Id.

Prompt passage of the compromise legislation by both the House and the Senate occurred notwithstanding a threatened veto by the President because of the broad-based taxes on petroleum and the corporate earnings of the manufacturing sector. See House Passes $9 Billion Superfund, Cincinnati Enquirer, Oct. 9, 1986, at A1, col. 1; Senate Dares Reagan in Superfund Approval, Cincinnati Enquirer, Oct. 4, 1986, at A3, col. 1. Despite his threats of veto, the President signed the Superfund legislation into law stating, "[t]he bill's financing has real concerns, but the health and safety of Americans are among the highest priorities of government . . . ." Cleanup Fund Gets $9 Billion, Cincinnati Enquirer, Oct. 18, 1986, at A3, col. 1.

35. See infra notes 40-46 and accompanying text.

36. See Karlen, Pollution: Now the Bad News, NEWSWEEK, Apr. 8, 1985, at 26. The article chronicles three reports that reflect the dire level of pollution extant today:

One, a congressional survey, indicated that toxic chemicals are being emitted into the air in more places—and in higher quantities—than ever suspected. Another, from the World Resources Institute, revealed data showing that acid rain poses a threat not just to the Eastern Seaboard, but to millions of acres of Western wilderness and timberlands as well. And a third survey, this one from previously undisclosed Public Health Service records, listed 1,484 sites that have been closed or restricted because of toxic contamination so severe that they threaten human health.

Id. Specifically, in connection with Superfund, "Only about 600 of the 20,000 dump sites in America are on the NPL [National Priority List, a toxic waste clean-up priority list authorized under Superfund]. Consequently, potential defendants responsible for the wastes on non-NPL sites can be fairly certain that the government will be unlikely to begin removal at these sites for many years, if ever." Seng, The Quasi-Contractual Nature of Cost-Recovery Actions Under CERCLA, 5 VA. J. NAT. RESOURCES L. 85, 175 (1985) (footnote omitted).

37. See, e.g., ALASKA STAT. § 46.03.822 (1982) (victim compensation on strict liability standard); Hazardous Substance Account Act of 1981, CAL. HEALTH & SAFETY CODE §§ 25186, 25300-25395 (West 1984) (also known as the California Superfund); FLA. STAT. ANN. § 376.12 (West Supp. 1981) (Oil Spill Prevention and Pollution Control Act applies to damage payment from nonhazardous spills to vessel or land); MASS. GEN. LAWS ANN. ch.
Given this situation, the future threat of environmental harm is potentially as great, or perhaps even greater, than the menace is today.\textsuperscript{38}

\section*{B. Available Means of Reducing the Risk}

The most publicized efforts to abate the risk of harm from human exposure to toxic substances or hazardous wastes have been spawned in the public sector at the federal legislative level.\textsuperscript{39} Of the environmental statutes that Congress has enacted, those of special importance in controlling toxic substances or hazardous wastes are: (1) the Resource Conservation and Recovery Act;\textsuperscript{40} (2) the Federal Insecticide, Fungicide, and Rodenticide Act;\textsuperscript{41} (3) the Safe Drinking Water Act;\textsuperscript{42} (4) the Federal Water Pollution Control Act;\textsuperscript{43} (5) the Clean Air Act;\textsuperscript{44} and, as previously noted, (7) the Comprehensive Environmental Response, Compensation, and Liability Act (Superfund).\textsuperscript{46} All of these federal statutory responses constitute a laudable effort to alleviate the environmental degradation problem. Their cardinal deficiency, however, is that they do not provide any form of victim compensation for injuries arising from the improper disposal of toxic substances or hazardous wastes.\textsuperscript{47} This flaw is a significant part of the toxic tort victim's dilemma.\textsuperscript{48}

\subsection*{1. Federal Laws}

\textit{a. The Resource Conservation and Recovery Act (RCRA).} Although perhaps inappropriately named,\textsuperscript{49} RCRA plays an integral role in the federal

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214, § 7A (West 1981) (10 or more Massachusetts citizens can seek injunction for state/local environmental law violations).


39. The commerce clause of the Constitution, U.S. CONST. art. I, § 8, provides Congress's authority for enacting the various federal environmental statutes.


42. 42 U.S.C. §§ 300f-300j (1982).


47. Some response costs are available to governmental units and individuals for removal and remedial action and related expenses under the Superfund legislation, but they are extremely limited and fall far short of being a meaningful form of compensatory relief. 42 U.S.C. § 9611(a)(1)-(2) (1982). Medical expenses and property damages, for example, are not recoverable as response costs. Note, \textit{supra} note 23, at 806.

48. Congress has not responded very sympathetically to the plight of the toxic tort exposure victim. For example, Congress has spurned repeated attempts to include a victim compensation provision in Superfund. Some, however, remain optimistic that victim compensation will soon come to fruition. Address by J. William Futrell, Hazardous Wastes, Superfund and Toxic Substances Conference (Nov. 1, 1985).

49. Although RCRA does relate to natural resource conservation and recovery, the overarching concern of the Act "is the effect on the population and the environment of the disposal
government’s assault on hazardous waste disposal. The Act prevents the discarding of hazardous wastes under circumstances that create an imminent and substantial endangerment to human health and the environment.50 Key components of this proscription are “imminent” (the statute does not prohibit a consummate danger)51 and “substantial,” which requires a balancing process, weighing the benefits against the costs.52

Apart from the overall prohibition against discarding hazardous wastes in manners posing threats to health and the environment, the mechanism that plays a prominent role in fostering the objectives of RCRA is what is commonly referred to as the “cradle-to-grave” requirements.53 These provisions prescribe rather stringent conditions under which hazardous waste is to be handled from the generator to the transporter and eventually to the disposal facility.54 Once hazardous wastes leave the site of generation, handlers, through a manifest system, account for the wastes throughout the disposal process. The generator must initiate the manifest, fully describing the nature and qualities of the waste;55 the transporter must then sign the manifest reflecting what material the generator has entrusted to him;56 finally, the disposer must execute the manifest to reflect the nature and qualities of waste that he actually accepts for disposal.57 To be sure, the cradle-to-grave provisions serve a laudable purpose and, if followed, engender an accounting system for hazardous waste disposal that should greatly alleviate the risks attendant to this activity.58


52. See Reserve Mining Co. v. EPA, 514 F.2d 492, 537-38 (8th Cir. 1975).


54. Id.

55. Id. § 6922(5). This statutory requirement applies only to off-site disposal of hazardous wastes. Id.

56. Id. § 6923(a)(3), (4).

57. Id. § 6924(2). Moreover, the EPA must properly issue a permit to disposal facilities before the facilities can operate lawfully. Id. § 6925(a).

58. Unfortunately, the hazardous waste disposal approach mandated in RCRA is ignored much too often. Nightmarish stories of clandestine midnight disposals of hazardous or toxic wastes in unapproved areas are common. See EPA Summary of Removal Actions at Hazardous Waste Sites Under Superfund Law, 14 ENV'T REP. (BNA) 13561 (Nov. 18, 1983) (contaminants discovered in containers on beach in Laguna Beach, California; midnight dumping of PCBs in Baldwin, Florida; abandoned drum found in stream in East St. Louis, Illinois; corrosive chemicals in drums illegally dumped at truck stop in Jackson, Mississippi).

The Environmental Protection Agency says that at least 14,000 illegal dump sites pose fire hazards, threaten groundwater, or emit fumes. And many environmentalists say that figure is low. U.S. industries generate 88 billion pounds of toxic waste a year, they claim, and 90 percent of that has been improperly disposed of.

Although RCRA is a significant spoke in the environmental protection wheel, the Act provides no method for a toxic or hazardous exposure victim to recover monetary damages for injuries suffered. First, the proscription in the Act is against imminent endangerments; the risk that causes an exposure victim's injuries has already materialized. Second, beyond the substantive violation question, RCRA is inadequate remedially. Basically, the remedy available under the Act is injunctive in nature. Since injunctions are a form of equitable, not legal, relief, they simply terminate the offensive activity and do not place monetary compensation in the hands of an injured party.

b. The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). FIFRA was enacted to impede the risk of harm emanating from the improper use and disposal of pesticides.\textsuperscript{59} Its most noteworthy feature is the provision that requires registration of pesticides with the EPA prior to their use. To be eligible for registration the pesticide must not, in the determination of the EPA, have the capability of creating unreasonable adverse effects on the environment.\textsuperscript{60} If a pesticide fails this criterion, its use will not be authorized.\textsuperscript{61}

Facially, FIFRA seems to offer significant protection from toxic or hazardous exposure injury. Here again, however, the available remedy does not embrace victim compensation.\textsuperscript{62} More significantly, FIFRA has failed miserably in terms of meeting its substantive goals. Very few pesticides have been properly registered since FIFRA's enactment,\textsuperscript{63} and, consequently, environmental dangers remain unchecked. Thus, FIFRA, in practice, has offered little in the way of curbing the unreasonable risk of injury arising from exposure to toxic or hazardous pesticides.\textsuperscript{64}

\textsuperscript{60} Id. § 136a(a) (5). Too many pesticides remain unregistered. W. RODGERS, ENVIRONMENTAL LAW 857 (1977). Bureaucratic uncertainty has "resulted in a great deal of controversy holding up the registration of several pesticides." Id. at 863. Notably, the agricultural use of pesticides is one of the prime sources of water pollution. R. FINDLEY & D. FARBER, ENVIRONMENTAL LAW IN A NUTSHELL 99 (1983). Thus, exposure to water contaminated by pesticides may cause hazardous or toxic exposure injuries.
\textsuperscript{61} 7 U.S.C. § 136a(c)(6) (1982). On paper, FIFRA looks good. In practice, however, the results have been different. Some now consider the Act an unmitigated disaster. Address by A. Alm, Environmental Law Conference (Feb. 23, 1984). This condemnation has raised strong doubts about the likelihood of the Act's reauthorization. Id. Legislative activity in this area was evident, however, as recently as the spring of 1986. See Davis, Panel Slogs Through Markup of New Pesticide Legislation, CONG. Q., June 14, 1986, at 1370.
\textsuperscript{62} As noted earlier, this omission is a common shortcoming of the various federal environmental statutes. Enforcement actions generally grounded upon the power of injunction are the ordinary means of relief. See Note, The Burden of Proof, supra note 19, at 210-11; see also Note, Developments in Victim Compensation Legislation: A Look Beyond the Superfund Act of 1980, 10 COLUM. J. ENVTL. L. 271, 271 (1985) [hereinafter cited as Note, Developments] (problem of absence of effective system of victim compensation for injuries caused by exposure to toxic chemicals has recently received increased attention).
\textsuperscript{63} "Approximately 45,000 pesticide products are currently marketed in the United States. The Environmental Protection Agency (EPA) regulates these products primarily on the basis of their pesticidal active ingredients. There are roughly 1,400 'active ingredients' in the 45,000 products now on the market." U.S. ENVTL. PROTECTION AGENCY, PESTICIDES FACT BOOK 1 (1986).
\textsuperscript{64} Note, David's Copperfield and FIFRA's Labelling Misadventures, 4 NOVA L.J. 107,
c. The Safe Drinking Water Act. The contamination of existing potable water supplies by toxic substances or hazardous wastes is one of the most serious forms of environmental pollution extant today. Groundwater is a primary water source that is frequently threatened by the leaching of improperly disposed toxic substances or hazardous wastes. This subterranean water supply furnishes water in varying percentages, depending on the region of the country, for human and animal consumption, industrial uses, and agricultural purposes. Moreover, reliance upon groundwater continues to rise steadily as surface water supplies dwindle or become more polluted.

The Safe Drinking Water Act is one promising statute for groundwater pollution victims. Basically, the Act interdicts those intrusions into the ground of contaminants that create an imminent endangerment to existent public water supplies. The only substantive limitation upon the attractiveness of the Safe Drinking Water Act in protecting groundwater is that the Act does not apply to private water supplies such as private wells. Consequentially, those exposed to toxic substances or hazardous wastes because of the contamination of private wells do not have claims that fall under the provisions of the Safe Drinking Water Act. At the risk of being tautological, a glaring deficiency of the Safe Drinking Water Act is the absence of a victim compensation provision. This deficiency does not bode well for a

107 (1980) (EPA's enforcement of FIFRA may create same pesticide pollution problems EPA seeks to prevent).
67. Id. at 6-7 (table 1.2 and figure 1.3), relying on statistics appearing in Murray, Water Use, Consumption, and Outlook in the U.S. in 1970, 65 J. AM. WATER WORKS A. 302-08 (1973) (groundwater, less important in industrial usage, provides significant percentage of supply for rural and urban domestic use and irrigation).
68. 42 U.S.C. §§ 300f-300j (1982). The Safe Drinking Water Act was recently amended, and the President signed the amendments on June 19, 1986. See Pub. L. No. 99-339, 100 Stat. 642 (1986). Some of the preeminent provisions of the new legislation are: (1) requiring the EPA to establish national primary drinking water regulations (§ 101); (2) strengthening the EPA's enforcement authority regarding underground injection of hazardous wastes that endanger underground sources of drinking water (§ 202); and (3) initiating a program "to protect critical aquifer protection areas located within areas designated as sole or principal source aquifers" (§ 203).
69. Note, Toxic Substance Contamination, supra note 19, at 58. The author also lists the Federal Water Pollution Control Act and the RCRA as other promising statutes.
70. Underground waste injections are principal targets of the Safe Drinking Water Act, although the Act proscribes other intrusive acts that endanger the quality of public water supplies as well. See 42 U.S.C. §§ 300f-300j (1982).
71. Id. § 300f(4) defines "public water system" as "a system for the provision to the public of piped water for human consumption, if such system has at least fifteen service connections or regularly serves at least twenty-five individuals."
72. Note, Toxic Substance Contamination, supra note 19, at 58.
73. See Johnson v. Tipton, 103 Ill. App. 3d 291, 431 N.E.2d 464, 467 (1982). No cause of action existed under the Safe Drinking Water Act for the contamination of the plaintiff's well. Hence, at no point in this common law toxic tort action was there any mention of the Act.
74. "Most of the imminent hazard provisions limit available relief to immediate injunctions." Note, Toxic Substance Contamination, supra note 19, at 59.
toxic tort exposure victim who invariably desires some form of compensatory relief for injuries suffered.

d. The Federal Water Pollution Control Act (Clean Water Act). The Clean Water Act is one of the most important federal environmental statutes. The Act is significant to the toxic tort exposure victim because of its provisions proscribing the unauthorized dumping of toxic or hazardous pollutants into surface waters. A cause of action is available, at least for injunctive relief, under the Act. The Clean Water Act, however, does not extend to victim compensation, a deficiency common among federal environmental statutes.

Significant sentiment exists that the Clean Water Act does not pertain to the insidious environmental threat of toxic or hazardous waste contamination of groundwater. At the crux of the problem is whether the term “navigable waters,” to which the Clean Water Act applies, encompasses groundwater. To date, courts have resolved this issue inconsistently, at least in regard to the injection of hazardous waste into underground wells. Ironically, one of the most significant environmental statutes may actually be impotent when it comes to addressing one of the most pressing toxic or hazardous exposure problems today.

76. See id. § 1311(a) (discharging pollutants in violation of the applicable effluent limitations is illegal); see also Chemical Mfrs. Ass’n v. NRDC, 105 S. Ct. 1102, 84 L. Ed. 2d 90 (1985) (Supreme Court read into statute fundamentally different factor, or FDF, variance for toxic water pollutants).
77. The EPA, when seeking to enjoin such activity, is not completely stymied by scientific uncertainty concerning the toxicity of the pollutant. The statute mandates that the EPA take those actions necessary to provide an “ample margin of safety.” 33 U.S.C. § 1317(a)(4) (1982). As a consequence, the EPA, for example, has been able to prohibit successfully the dumping of low chlorinated PCBs into surface waters, although scientific knowledge of possible deleterious effects was virtually limited to more chlorinated PCBs. See Environmental Defense Fund v. EPA, 598 F.2d 62, 83-85 (D.C. Cir. 1978).
78. See Exxon Corp. v. Train, 554 F.2d 1310, 1329-31 (5th Cir. 1977).
79. Courts have generally been liberal in applying the “navigable waters” criterion, found in 33 U.S.C. § 1251(a)(1) (1982), in connection with surface waters. See W. RODGERS, supra note 60, § 4.5, at 390 (“[t]he test of navigability is whether the watercourse could be used for commerce, not whether it is used, and this inquiry extends to ‘the distant past and extended future’”) (citing United States v. Sunset Cove, Inc., 3 ENVTL. L. REP. (ENVTL. L. INST.) 20,370, 20,372 (D.C. Or. 1973), aff’d in part, 514 F.2d 1089 (9th Cir. 1975)).
e. The Toxic Substances Control Act (TOSCA). Of all the federal environmental statutes TOSCA provides the most comprehensive regulation of toxic substances, most notably industrial chemicals. The Act proscribes those toxic substances that create an unreasonable risk of harm or injury to health and the environment. One should underscore "unreasonable" in describing the unacceptable risk embraced by the language of the statute. This all important determination of reasonableness often involves balancing competing interests in a manner similar to that used in nuisance cases. The gravity of the harm threatened must overshadow the social utility of the activity producing the injury before courts will deem the risk unreasonable and thus invoke the statute.

Even though a court may determine that a chemical creates an unreasonable risk, the statute is simply regulatory; its violation does not entitle the victim to any form of compensatory damages. Here again, a federal environmental statute's inutility to the toxic substance or hazardous waste exposure victim is painfully evident.

f. The Comprehensive Environmental Response, Compensation, and Liability Act (Superfund). Superfund is primarily designed to provide the EPA with authority and resources to clean up the worst of the increasing

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at A18, col. 1 (citing costs, President pocket vetoed clean Water Amendments Act of 1986 on Nov. 6, 1986).
83. Id. § 2601(a)(2).
84. A use or activity only amounts to a public or private nuisance if the activity constitutes an unreasonable interference with a protected interest. Generally, the plaintiff must show that the gravity of harm involved outweighs the social value of the activity. See RESTATEMENT OF TORTS §§ 826, 828 (1939). More recently, some courts have sought guidance from the RESTATEMENT (SECOND) OF TORTS §§ 826, 829A (1977), which adopts an alternative balancing calculus that increases the likelihood of finding an unreasonable interference:

An intentional invasion of another's interest in the use and enjoyment of land is unreasonable if (a) the gravity of harm outweighs the utility of the actor's conduct, or (b) the harm caused by the conduct is serious and the financial burden of compensating for this and similar harm to others would not make the continuation of the conduct not feasible. Id. § 826.
86. Note, supra note 23, at 804 n.32. Existing federal statutes "seek to control the behavior of the polluter rather than to compensate the victims of polluting conduct." Id.
87. Id. at 806 n.36.
88. The provision of TOSCA that has generally been most ineffectual is the one mandating the premanufacture notification to the EPA for new chemical substances. Very few illuminating notifications have actually occurred, primarily because chemical manufacturers allege confidentiality and that the use and disclosure of this information offends the Trade Secrets Act, 7 U.S.C. § 136(h) (1982). But see Ruckelshaus v. Monsanto Co., 104 S. Ct. 2862, 81 L. Ed. 2d 815 (1984). The Court held that the EPA's use or disclosure of similar information concerning pesticides obtained under FIFRA did not violate the fifth amendment taking clause, U.S. CONST. amend. V, § 4. 104 S. Ct. at 2876, 81 L. Ed. 2d at 835. Because of the EPA's inability to obtain vital information about the toxicity of many chemicals currently in use, the EPA has essentially been forced to regulate in the dark.
number of hazardous waste sites. Superfund's central feature is now a $9 billion fund that primarily permits the EPA to clean up hazardous waste sites before attempting to recover the costs of such cleanup from the responsible parties. Strict liability is the standard of liability imposed upon a responsible party; this liability is generally considered to be joint and several. To be sure, these touchstones inure to the benefit of the government when seeking recovery of cleanup costs. Secondarily, Superfund also imposes liability up to $50 million for damages to governmentally owned natural resources resulting from the release of hazardous substances.

But where does Superfund leave an individual victim of exposure from a hazardous waste site? The answer is quite simple, but all too common: the individual must pursue compensatory relief in state courts, normally pursuant to common law theories, for Superfund has no general victim compensation provision. The lack of authority for awarding individuals compensatory relief is more apparent here than in, perhaps, any other federal environmental statute because Congress has repeatedly rebuffed efforts to place a victim compensation provision in Superfund.

91. The $1.6 billion revolving fund expired at the end of fiscal 1985. Congress passed new Superfund legislation recently, however, and the President signed it into law. See supra note 34.
94. See United States v. Chem-Dyne Corp., 572 F. Supp. 802, 807-08 (S.D. Ohio 1983). Congress specifically rejected efforts to provide expressly for joint and several liability in Superfund legislation. Some courts, however, have implied such liability because Congress has never specifically precluded the liability by statutory language. Id. Others have looked to principles of joint and several liability embodied in RESTATEMENT (SECOND) OF TORTS § 433B (1964). But see Epstein, Two Fallacies in the Law of Joint Torts, 73 GEO. L.J. 1377, 1382-88 (1985) (application of joint and several liability would hold all defendants equally liable for clean-up costs even though their fractional contributions might vary widely).
95. The advantages of not having to implicate a responsible party's conduct by establishing fault are self-evident. Even more significant, however, is that "entire liability" offers the government the opportunity to recover the entire amount of the clean-up costs from any one of several possible responsible parties.
97. The Superfund legislation does create a right of action, justiciable in federal court, for private and nonfederal plaintiffs to recover necessary "response" costs resulting from a release of hazardous substances. . . . This provision, however, only provides for compensation of limited response costs, specifically precluding money damages for medical expenses, property loss, and so-called health prophylactic damages.
Note, supra note 23, at 806 (footnote omitted).
98. Congress initially included a victim compensation provision in the Superfund legislation just enacted. As expected, the chances for its passage were nil. Address by F. Grad, Environmental Law Conference (1984). Some individuals, however, continue to maintain that victim compensation is not a dead legislative issue. Address by J. Futrell, Hazardous Wastes, Superfund and Toxic Substances Conference (Oct. 31-Nov. 2, 1985). Mr. Futrell is the President of the Environmental Law Institute.
9. Concluding Remarks on Federal Environmental Statutory Protections. Two writers, recently commenting on Superfund, observed that it contains "no provisions for the recovery of damages for personal injury and property damage resulting from exposure to hazardous wastes." This statement can be fairly ascribed to all of the primary federal environmental statutes, thus greatly undermining the adequacy of a federal cause of action resulting from an environmental toxic tort. Consequently, in the federal sector, a hazardous or toxic waste exposure victim cannot reach even the arcane questions of statute of limitations, causation, and apportionment of damages, for no private cause of action for damages exists for transgression of the various federal environmental statutes.

This major shortcoming of federal law fosters a situation marked by inadequate compensation, less than desirable deterrence, and little, if any, corrective justice between the parties. Against this backdrop, it is clear that "[i]ndividual victims cannot be ignored today in the hope that government may decide to protect the common weal tomorrow." Until Congress acts positively, however, individual victims must focus upon state statutory and common law to seek redress for their toxic or hazardous exposure injuries.

2. State Environmental Statutes

"Environmental protection is now one of society's imperatives, and, accordingly, is perceived as one of government's fundamental responsibilities." That this responsibility is shared by both the federal government and its state counterparts is well-established. In pursuit of this objective, several states have enacted environmental protection legislation and es-

99. Zazzali & Grad, supra note 4, at 446.
100. See supra notes 49-98 and accompanying text.
101. Zazzali & Grad, supra note 4, at 458-59.
102. The United States Supreme Court quelled any notion that some federal common law causes of action might overcome the deficiency of the federal statutes when the Court held that the detailed provisions of the Clean Water Act signaled preemption of the federal common law of nuisance with respect to interstate water pollution. City of Milwaukee v. Illinois, 451 U.S. 304, 326 (1981). The same rationale probably applies to the Clean Air Act and perhaps to other federal environmental statutes as well. See R. Findley & D. Farber, supra note 60, at 64.
103. Congress's unwillingness, to date, to add a victim compensation provision to the federal environmental statutes may not be grounded on sound policy notions; rather, a more plausible explanation is that no political consensus exists in Congress to support this provision. "CERCLA was originally drafted with a provision for victim compensation, but this provision was deleted in a compromise with legislators perceived as necessary to secure Congress' approval of the Act." Note, Developments, supra note 62, at 272 n.5.
104. Zazzali & Grad, supra note 4, at 474. If the individuals who cause the damages bear the cost, which generally does not occur in toxic tort litigation, these individuals contribute to the general welfare.
106. Id. at 329-30 n.3. Federal environmental statutes have granted significant implementation responsibilities to the states. The Clean Air Act grants the basic responsibility for developing a State Implementation Plan, and for granting variances to its provisions, to the states. 42 U.S.C. § 7410 (1982).
Verdicts on the effectiveness of these state laws have been mixed.108 Most state statutes provide principally for injunctive relief, like their federal counterparts.110 This flaw diminishes the utility of these statutes to toxic tort victims.111 In a rare instance, California has enacted a statute that provides for actual compensation of the victim of an environmental tort for personal injuries or property damage.112 Otherwise, exposure victims have had to resort to the relevant state workers’ compensation laws for occupational exposure injuries and traditional common law doctrines for nonoccupational injuries.113 The proof requirements for causation are slightly less onerous in the workers’ compensation field than for common law torts, but proof problems persist in both.114 Hence, establishing the requisite causal connection between the toxic or hazardous exposure brought on by the defendant’s conduct and the injury suffered by the plaintiff is a conundrum irrespective of the particular legal forum.


108. ARK. STAT. ANN. § 5-908 (1976), for example, authorizes the Arkansas Pollution Control and Ecology Department.

109. The problem may not lie with the substantive features of the various state environmental statutes, but rather with the state enforcement mechanisms. Inadequate financing and staffing of the environmental agencies, coupled with a strong undercurrent of political pressure, have adversely affected the efficacy of the enforcement of state environmental laws. Moreover, most state environmental protection acts (SEPAs) specifically do not cover private activities. See N.C. GEN. STAT. § 133A-4(2) (1983); VA. CODE § 10-178 (1985). Some SEPAs do not even mandate compliance by local governments. See MD. NAT. RES. CODE ANN. § 1-301(d) (1983); N.C. GEN. STAT. § 113A-8 (1983). For a detailed discussion of the parameters of SEPAs see Pridgeon, Anderson & Delphey, State Environmental Policy Acts: A Survey of Recent Developments, 2 HARV. ENVTL. L. REV. 419 (1977).

110. See, e.g., ALASKA STAT. § 46.03.822 (1982) (victim compensation on strict liability standard); Hazardous Substance Account Act of 1981, CAL. HEALTH & SAFETY CODE §§ 25186, 25300-25395 (West 1984) (also known as the California Superfund); FLA. STAT. ANN. § 376.12 (West Supp. 1981) (Oil Spill Prevention and Pollution Control Act applies to damage payment from nonhazardous spills to vessel or land); MASS. GEN. LAWS ANN. ch. 214, § 7A (West 1981) (10 or more Massachusetts citizens can seek injunction for state/local environmental law violations).


113. Here again the traditional common law tort theories are generally strict tort liability, private and public nuisance, trespass, and negligence. Note, supra note 105, at 330.

114. Moreover, workers’ compensation laws, although dispensing with fault requirements and, generally, dispensing with the affirmative defenses of contributory negligence, assumption of the risk, and the fellow servant doctrine, contain limitations to recovery and are usually an employee’s exclusive remedy against the employer. An action in tort against a third-party tortfeasor is always a possibility. See 2A A. LARSON, WORKMEN’S COMPENSATION LAW § 71.00 (1983).
3. Common Law Theories

Unlike the various federal and state environmental statutes, which are basically regulatory, the common law tort system extends the prospect of compensatory relief to a toxic tort victim. Whether the cause of action is grounded in trespass, negligence, public or private nuisance, strict liability in tort, or strict products liability in tort, the likelihood exists that the exposure victim will receive some measure of compensation for his or her injuries, provided the victim successfully prosecutes his or her suit. Because of this possibility the common law of torts appears at first blush to be the most promising means of providing relief for injuries suffered from environmental torts. Upon serious reflection, however, the traditional common law of torts may not be so promising, at least in its unadulterated form. Under each of the traditional tort theories, for example, proof of causation is an essential predicate for recovery. Proof of causation may create a virtually insurmountable hurdle for the victim because of the unique nature of a toxic tort injury. This Article later examines the causation element in an attempt to ascertain a less onerous means by which causation may be established in a toxic tort suit.

4. Scientific Prophylactic Alternatives: An Ounce of Prevention May Be Worth More Than a Pound of Cure

Scientific knowledge is a major underpinning of effective environmental protection. Specifically, science plays a prominent role as a predictor of the environmental consequences of a certain activity. In the acid rain controversy, for example, science has benefitted society by determining that scrubbers in the smokestacks of coal plants and smelters can mitigate sulfur dioxide and nitrogen oxide emissions and thus alleviate the incidence of ruinous acid rain pollution. In the scientifically based effluent limitations that are required under the Clean Water Act, owners can box out two-thirds or more of the effluent discharges from their facilities. Industry unerringly claims that regulations are too stringent, and sometimes claims “that regulations are too stringent and not supported by scientific evidence.” Industry perhaps may even use scientific uncertainty as a ruse to avoid additional costs associated with the utilization of advanced scientific knowledge to prevent further environmental degradation.

116. In certain circumstances courts may grant punitive or exemplary damages in addition to compensatory damages. The standards for making a punitive damages award vary from jurisdiction to jurisdiction, but the common requirement seems to be an element of conscious wrongdoing. C. Mccormick, Damages 188 (1935).
117. “Unadulterated form” means traditional tort principles, free from any significant modification.
118. See Note, Developments, supra note 62, at 272-73 (toxic tort plaintiffs must carry the traditional burden of proving causation). The principal factors complicating the causation question are latency and causal indeterminacy. Id. at 273 n.9.
119. See infra notes 134-255 and accompanying text.
120. Ironically, a frequently cited reason for the deficiencies in the regulatory control of the environment under the various federal and state statutes is the lack of scientific certainty. See Trubatch, Informed Judicial Decisionmaking: A Suggestion for a Judicial Office for Understanding Science and Technology, 10 Colum. J. Envtl. L. 255, 255-56 (1985). Industry undoubtedly has an economic stake, and, as a result, sometimes claims “that regulations are too stringent and not supported by scientific evidence.” Id. at 256. Industry perhaps may even use scientific uncertainty as a ruse to avoid additional costs associated with the utilization of advanced scientific knowledge to prevent further environmental degradation.
121. Although little doubt exists about the effectiveness of scrubbers in relieving the acid rain problem, industry continues to maintain that scrubber costs outweigh the environmental
under the Clean Water Act¹²² and emission limitations under the Clean Air Act,¹²³ Congress and the EPA have formulated within the statutes themselves and through administrative regulation and rulemaking an essentially scientific prediction of what is an acceptable level of water and air pollution.¹²⁴ These limitations are simply predictions of the greatest amount of water and air pollution reasonably allowable without creating an undue danger to human health and the environment.¹²⁵ Stated somewhat differently, these limitations are the minimum prophylactic standards to which industry must comply in order to protect the environment.¹²⁶

Science not only fulfills its role as a prognosticator in the various ways mentioned above, but it also can help prevent deleterious degradations of the environment by devising alternative means for the disposal of pollutants. A perfect case in point is the disposal of toxic or hazardous wastes. Toxic or hazardous waste sites pose a significant risk of contamination to groundwater supplies.¹²⁷ Scientific studies suggest that burning most, if not all, of this waste may be a feasible alternative.¹²⁸ Burning the wastes would allevi-
ate the leaching problem associated with the threat to the groundwater created by hazardous waste sites.²² Of further importance in the preventive role played by science are the monitoring and modelling processes aimed at keeping environmental pollution in check. Moreover, field and laboratory studies are invaluable aids to effective environmental planning.²³

In summary, science is a good predictor; as such, its primary environmental role is preventive in nature. This role is vital because the cost of preventing an environmental disaster is generally much less than the cost of cleaning up one.²⁴ Thus, through science, an ounce of prevention may be worth more than a pound of cure.

²². A good example of the adage that prevention is cheaper than cure is the Times Beach, Missouri, environmental disaster. Cleanup costs incurred exceeded the amount that would have been required to avert the dioxin contamination in the first place by millions of dollars. For a discussion of the huge costs associated with pollution see T. Schoenbaum, supra note 26, at 8. The costs include: (1) "the loss of resources through unnecessary wasteful exploitation, (2) the cost of pollution abatement control, (3) the cost in human health." Id.
III. TOXIC TORT LITIGATION: THE CAUSATION PROBLEM

A. Applying Traditional Tort Principles to the Nontraditional Toxic Tort: A Conundrum

The application of traditional tort principles to toxic tort cases greatly increases the difficulty of recovery by an exposure victim. The simple explanation for the unusual problems attendant to toxic tort litigation is that traditional common law tort principles do not apply very well to this nontraditional tort with its inherent idiosyncrasies, which were unknown when the conventional rules evolved. One of the more formidable roadblocks to successful toxic tort litigation, from the exposure victim’s perspective, is establishing the element of causation, an integral component of any toxic tort case irrespective of the underlying liability theory.

Trial lawyers have the responsibility to protect tort victims. Courts also, informed by the analyses of many individuals, including legal scholars, should explore theories that will reduce the plaintiff’s burden with respect to causation and at the same time promote the traditional policy objectives of tort law. This Article now focuses on modifications to the common law of torts that may facilitate the application of the causation element to the field of toxic torts.

134. Note, supra note 1, at 583-84. “Causal indeterminacy . . . creates great difficulties for a toxic waste victim attempting to prove causation under common law rules.” Id. at 584; see Trauberman, supra note 19, at 197-201; Comment, “Close Encounters of the Toxic Kind”—Toward an Amelioration of Substantive and Procedural Barriers for Latent Toxic Injury Plaintiffs, 54 TEMP. L.Q. 822, 824 (1981) [hereinafter cited as Comment, Close Encounters]; Note, Establishing Causation in Chemical Exposure Cases: The Precursor Symptoms Theory, 35 RUTGERS L. REV. 163, 180 (1982); see also Comment, Agent Orange as a Problem of Law and Policy, 77 NW. U.L. REV. 48, 65-71 (1982) [hereinafter cited as Comment, Agent Orange] (proof of causation is one of the greatest barriers to recovery by veterans for exposure to Agent Orange).

One commentator noted that “[t]he evaluation of a personal injury case arising from exposure to toxic materials presents a lawyer with a challenge of great dimensions.” Landau, Hurting the Barriers to Toxic Tort Recovery: An Update, TRIAL, Apr. 1983, at 40, 41.

135. The common law rules arguably operate reasonably well in connection with sporadic accidents, the traditional type of circumstance that the tort system has been generally concerned with over the years. But see Rosenberg, supra note 6, at 854. “Current criticism of the tort system as a scheme too cumbersome, costly, and haphazard to accomplish its accident prevention and compensation objectives . . . suggests that our reliance on private damage actions is misplaced.” Id. (footnote omitted) (citing J. O’CONNELL, THE LAWSUIT LOTTERY 130, 140-45 (1979); Pierce, Encouraging Safety: The Limits of Tort Law and Government Regulation, 33 VAND. L. REV. 1281, 1300 (1980)).

136. The toxic tort victim must overcome a number of barriers to prevail in private litigation. The victim must (1) meet the statute of limitations requirements, (2) identify responsible defendants, and (3) indict the conduct of a specific defendant or a group of defendants. See Note, Developments, supra note 62, at 272-73. One of the most sophisticated problems is meeting the standards prescribed for complying with the burden of proof of causation. Rosenberg, supra note 6, at 855.

137. Landau, supra note 134, at 41.

138. Compensation, deterrence, and corrective justice between the parties are generally recognized as the chief goals of tort law. See supra text accompanying note 8.

139. “This field is ripe for imaginative approaches to legal problems.” Landau, supra note 134, at 41.
B. The Traditional Approach to Causation: Why It Fails in Toxic Tort Cases

Because the various federal and state regulatory statutes provide no adequate compensatory relief for harm suffered by a toxic substance or hazardous waste exposure victim,\textsuperscript{140} private tort litigation is the primary, if not exclusive, means of redressing such harm.\textsuperscript{141} Courts generally apply traditional tort principles, including those pertaining to causation,\textsuperscript{142} to ascertain whether an alleged exposure victim's injury warrants recovery. The flaws of the common law approach to causation in toxic tort litigation stem primarily from the unique nature of a tortious injury resulting from the exposure to toxic or hazardous wastes.\textsuperscript{143} These injuries generally remain dormant for a number of years before manifesting themselves.\textsuperscript{144} In addition, in the case of groundwater contamination, defining the migration patterns of toxic substances or hazardous wastes through the soil frequently presents complicated problems.\textsuperscript{145} Uncertainty as to the effects of hazardous substances on the human body also has created significant hurdles to establishing a causal nexus between the exposure resulting from the defendant's conduct and the plaintiff's ensuing injuries.\textsuperscript{146} In short, a plethora of uncertainty spawned by prolonged latency periods and scientific causal indeterminacy portend trouble for plaintiffs in lawsuits seeking damages for personal injury or property damage resulting from exposure to toxic substances or hazardous wastes.\textsuperscript{147}

\textsuperscript{140} For a discussion of this deficiency in the various environmental statutes see supra notes 49-114 and accompanying text. See also Keller, \textit{Toxic Tort Litigation: The Management Challenge}, TRIAL, Apr. 1983, at 50, 51.

\textsuperscript{141} Keller, supra note 140, at 52.

\textsuperscript{142} Id.

\textsuperscript{143} The same problem also persists to some degree in cases involving exposure to hazardous products. Although scientists know much about asbestos, for example, proof of causation problems in asbestos cases are greater than in conventional tort actions. In any asbestos case substantial problems may occur in demonstrating that the injury of the plaintiff resulted from the exposure to asbestos for which the defendant was responsible. This was especially true a few years ago when the probability of asbestos exposure was almost limitless, thus creating a number of possible sources of exposure and reducing the likelihood of establishing causation by the preponderance of the evidence.

\textsuperscript{144} See Levy, \textit{Radiation Litigation—The Emerging Tort Field}, 1981 TRIAL LAW. GUIDE 568, 571 n.3 (asbestos exposure has a 15-25-year latency period; vinyl chloride has a 20-year latency period). See generally Ginsberg & Weiss, \textit{Common Law Liability for Toxic Torts: A Phantom Remedy}, 9 HOFSTRA L. REV. 859, 921-22 (1981) (comments on latency phenomena in toxic and hazardous exposure cases); Trauberman, supra note 19, at 180 (latency period between exposure and manifestation of cancer may range between 5 and 40 years).

\textsuperscript{145} Some continue to subscribe to the notion that the migration patterns of hazardous wastes are fraught with scientific uncertainty in terms of the direction of the flow and its velocity. See Johnson v. Tipton, 103 Ill. App. 3d 291, 431 N.E.2d 464, 470 (1982). This uncertainty can frustrate the injured party's ability to meet the conventional burden of establishing the requisite causal connection.

\textsuperscript{146} Asbestos is a prime example. Although scientists were fairly certain of the causal connection between the inhalation of asbestos and the contracting of cancer (mesotheloma) or asbestosis, scientists were less certain about the effects of the ingestion of asbestos on human health. See Reserve Mining Co. v. EPA, 514 F.2d 492, 510-14 (8th Cir. 1975).

\textsuperscript{147} See Trauberman, supra note 19, at 197-201; Comment, \textit{Acid Rain—The Limitations of Private Remedies}, 1983 S. ILL. U.L. REV. 515, 516-21; Note, \textit{The Burden of Proof}, supra note 19, at 207-08.
How are these unique aspects of toxic tort litigation incongruous with common law causation principles? The answer is almost transparent. First, the plaintiff has the burden of proof on the issue of causation. Once again, to meet this burden, the injured party must establish by the preponderance of the evidence, which is a probability in excess of fifty percent, that but for the defendant's conduct, the plaintiff would not have been injured or that the defendant's conduct was a substantial factor in bringing about the plaintiff's injury. In toxic tort litigation the plaintiff will have a difficult, if not impossible, task in establishing specific causation by the preponderance of the evidence because of the long lapse of time usually involved, the practical difficulty of pinpointing the specific source of the contamination, and the arduous task of identifying the responsible party.

C. Possible Alternatives to the Traditional Approach to Causation in Toxic Tort Litigation

Traditional causation principles such as the specific causation requirement, the preponderance rule, the "but for" test, and the "substantial factor" test are generally unsuitable for toxic tort litigation for the various reasons discussed above. The formulation of alternative causation theories that are consonant with toxic tort thus is necessary to ensure that meritorious claims do not go uncompensated or undercompensated and, more significantly, that tort law remains a ready source of compensation for the innocent exposure victim, a means of deterring the culpable party, and a vehicle for achieving some semblance of corrective justice between the parties. Therefore, a discussion of alternate theories to and possible modifications of conventional causation principles dominates the next few sections of this Article.

A cardinal tenet of traditional common law torts is that the plaintiff must prove that the defendant is responsible for the plaintiff's harm. This principle does not generally present any insurmountable problems to the plaintiff...
in a typical, sporadic accident situation. In the case of a toxic tort, however, in which identifying the toxic substance or hazardous waste that caused the exposure injury and the responsible party is difficult, the relentless quest for particularistic evidence of specific causation simply tends to obliterate the plaintiff’s chances of recovery.

Given this unpleasant prospect, serious consideration has been given to devising possible exceptions to the rule of imposing liability only on the person responsible for the harm. Developing exceptions to the requirement of specific causation has been justified mainly on the basis that requiring the innocent exposure victim to bear the entire loss simply because he or she cannot meet the arduous, if not impossible, task of establishing the specific cause of his or her toxic injuries is contrary to public policy. The necessity of producing vast amounts of sophisticated statistical data correlating certain diseases and environmental exposures makes the requirement of demonstrating specific causation even more strenuous. Thus, the dispositive issue centers fittingly upon how to assuage the causation problems in toxic tort litigation presented by an unswerving adherence to the rule of specific causation. To date, the response to this challenge has more often than not entailed the creation of some mechanism to ease the plaintiff’s burden, most commonly the shifting of the burden to the shoulders of the defendant. The resolution of the causation problem thus has simply been accomplished

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154. Generally, the plaintiff can readily identify the responsible tortfeasor and discern the instrumentality causing the injury. Moreover, a close temporal relationship ordinarily exists between the act of the defendant and the resulting injury to the plaintiff. One commentator, however, has questioned the accuracy and fairness of the causation determination in these tort cases under the preponderance of the evidence rule. Rosenberg, supra note 6, at 855-59.

155. Particularistic evidence is direct, nonstatistical evidence of the causal connection. Id. at 857, 869. This evidence generally is preferable to statistical or probabilistic evidence even though close reflection reveals that a high degree of probability inheres to particularistic evidence. As some have astutely noted, direct eye-witness evidence is perhaps more inherently suspect than circumstantial evidence. See PROSSER, supra note 16, § 39, at 243.

156. Schwartz & Means, supra note 153, at 1100-01; see also Zazzali & Grad, supra note 4, at 457 (proof of causation is major recurring issue).


158. See Sindell v. Abbott Laboratories, 26 Cal. 3d 588, 607 P.2d 924, 928-29, 163 Cal. Rptr. 132, 136-37 cert. denied, 449 U.S. 912 (1980); Summers v. Tice, 33 Cal. 2d 80, 199 P.2d 1, 4 (1948). But see Zafft v. Eli Lilly & Co., 676 S.W.2d 241, 246 (Mo. 1984) (court rejected policy argument that innocent plaintiff should recover even if defendant who caused the harm not specifically identified; court noted that not all deserving plaintiffs are assured of winning in the tort system).

159. Zazzali & Grad, supra note 4, at 457-58.

160. Id. at 458. “[P]roof of the causal connection between exposure and injury is an almost overwhelming barrier to recovery, particularly in smaller cases (regardless of their merit) because the cost of mounting the massive probative effort and the arrays of technical and scientific evidence will be prohibitive.” Id.

161. The effect of this shift in responsibility is that the causation burden of proof is as difficult for the defendant to meet as for the plaintiff, so the plaintiff’s chances of recovery increase when the burden shifts to the defendant. “Defendants will be faced with the same difficulties of proof that would have barred the plaintiff’s recovery had the theory of joint liability not been applied to assist his case.” Note, Causation, supra note 38, at 677 (emphasis in original); see also Rosenberg, supra note 6, at 856 n.28 (defendants have no better information than plaintiffs on issue of specific causation).
by placing the defendant in the uncomfortable shoes once worn exclusively by the plaintiff.

1. Alternative Liability

One noteworthy exception to the specific causation rule is the principle of alternative liability that seminally arose out of *Summers v. Tice*, 162 a case with a very intriguing fact pattern. The plaintiff was shot in the eye by someone firing a gun. The two defendants had negligently discharged their guns in the plaintiff's vicinity. The plaintiff, however, could not identify which of the two defendants actually shot him. The court, while clearly seeking to mete out some form of corrective justice in view of the consequent proof dilemma that faced the plaintiff, ruled that the burden of proof as to causation was shifted to the defendants to establish that they did nothing to cause the plaintiff's injury. 163 Furthermore, the court shifted the burden of apportioning damages to the defendants. 164 These shifts dramatically reduced the plaintiff's burden of establishing the defendants' liability by simply placing the defendants in the same difficult position that the plaintiff would otherwise have occupied. The court was willing to advance its policy objectives in this extraordinary manner because fault clearly existed on the part of both defendants, and alternative liability would, therefore, not do violence to the interests of either. 165 Moreover, the court's action simply expressed the basic principle that tort liability should fall on the party most likely to have done the harm as opposed to the purely innocent one.

In its application to the field of toxic torts the alternative liability theory is naturally appealing because of the ameliorative effect it has upon the plaintiff's causation burden. The exposure victim's likelihood of recovering from a culpable defendant is markedly enhanced when the defendant carries the causation onus. 166 Limitations as to the application of the alternative theory serve to diminish its attractiveness, however. Courts are generally loath to adopt this exception to specific causation in cases involving no clear indication that all the defendants are at fault; 167 moreover, courts are naturally


163. 199 P.2d at 5.

164. Traditional tort concepts impose both the burdens of proof of causation and apportionment, which the plaintiff must establish by the preponderance of the evidence, upon the plaintiff. In *Summers*, however, the defendants had access to evidence and were in a better position to establish what happened. Kircher, *Federal Product Legislation and Toxic Torts: The Defense Perspective*, 28 VILL. L. REV. 1116, 1126 (1982-1983).

165. See Prosser, supra note 16, § 41, at 271. The author suggests that imposing alternative liability in an instance of an innocent defendant would cause an injustice. Id.

166. The alternative liability theory will not assure the exposure victim of recovery in every case because of the possibility, however remote, that a defendant could exonerate himself or herself by showing that he or she did not cause the plaintiff's injury. Realistically, however, the odds of this eventuality are slim. See Rosenberg, supra note 6, at 856 n.28.

disinclined to embrace the alternative liability theory when all possible defendants are not before the court. In both instances, the courts' reluctance is probably attributable to a fear of deviating too far from the norm that a court cannot hold a defendant legally responsible for a plaintiff's harm without some causal relationship between the defendant's tortious conduct and the plaintiff's harm. To be sure, the prospect of contravening this principle may be unacceptably high when a defendant may not be at fault, but simply cannot prove it, or when an alleged tortfeasor may not be before the court with the opportunity to exonerate himself or herself. In many toxic substance or hazardous waste exposure situations, all defendants frequently may not be at fault or may not be present, and courts may consequently rebuff the alternative liability theory. This rebuff may very well foreclose an indispensable means of recovery for a toxic tort victim.

2. Concert of Action Theory

While the alternative liability theory may fall short of its desired goals in certain limited circumstances, another theory, the concert of action theory, may supplement alternative liability quite well. In fact, one writer has boldly postulated, "[d]efendants in environmental cases will be the next target of 'concert of action.'" 

Probably the paradigmatic case employing the concert of action theory to overcome the type of causation problem generally prevalent in toxic tort litigation, identifying the responsible defendant, is Bichler v. Eli Lilly & Co. In Bichler the focal point of the lawsuit was whether Eli Lilly could be held responsible to the plaintiff for cancer she allegedly developed as a result of her mother's consumption of DES, a drug manufactured and distributed by Eli Lilly and numerous other companies as a prophylactic to miscarriages and other pregnancy problems. The complex problem confronting the plaintiff was the virtual impossibility of demonstrating that Eli Lilly manufactured the DES that her mother had ingested. This problem would undoubtedly have been a fatal shortcoming under the specific causa-


169. Kircher, supra note 164, at 1119.

170. Moreover, a corresponding risk exists that the party who actually caused the injury may not be a party to the proceedings if all defendants are not before the court, which may work an injustice upon the party defendants.

171. An inherent problem of toxic tort litigation is the identification of the responsible parties. Given this difficulty, the limitations to alternative liability probably could not be overcome in many cases.

172. The concert of action theory has its genesis in the venerable common law rule that, if two or more defendants act pursuant to a common design, each of them is entirely liable for the tort actually committed by another. In theory, only one tort occurs, and that tort is chargeable to each member of the concerted action. See Prosser, supra note 16, § 46, at 323.


175. Appleson, supra note 173, at 1209.
tion rationale, but the court developed an innovative alternative under the rubric of concert of action to ease the causation burden. The court characterized the conduct of the DES manufacturers as “conscious parallelism,” a type of concerted action that resulted in making any of the manufacturers liable for the plaintiff’s entire damages despite the plaintiff’s inability to identify the manufacturer of the drug taken by her mother. Consistent with the original common law understanding of joint tortfeasor liability, the plaintiff was able to select any participant in the concerted activity and sue and recover without identifying the actual responsible party.

Applying the concerted activity theory specifically to the realm of environmental torts indubitably has a tremendous appeal to an exposure victim. The concerted activity theory fineses the problem of the unidentifiable defendant. Critics have contended, however, that this device unduly undermines traditional tort principles and unwisely eviscerates the concept of causation from tort liability.

3. Market Share Theory

The policy underpinnings for the concert of action exception to the specific causation rule similarly undergird the market share theory. Namely, when the ability to identify the party responsible for the exposure has been significantly eroded by a protracted latency period or the generic resemblance of a product manufactured by a number of different entities, a court, facing a choice between denying compensation to a victim and imposing liability on a company that may not have caused the harm, should allow the injured party to recover. Sindell v. Abbott Laboratories was the seminal case utilizing the market share approach to accomplish this policy objective without requiring the plaintiff to establish the specific identity of the manufacturer of the DES that was actually ingested.

The difficulty that the plaintiff experienced in Sindell was strikingly similar to that experienced by the plaintiff in Bichler. The Sindell court, however, adopted a different tack to accomplish the desired result of providing compensation to the injured party. The Sindell court held that if the plaintiff

176. See Phillips, supra note 162, at 1173. The author theorizes that “liability only on the basis of actual cause . . . would require identification of the particular defendant.” Id.

177. 55 N.Y.2d at 585, 436 N.E.2d at 188, 450 N.Y.S.2d at 782. Conscious parallelism has been defined as “acting the same way, pursuing the same goal.” Appleson, supra note 173, at 1209.

178. Kircher, supra note 164, at 1124. The “drug companies had acted independently of each other in failing to do such testing, but . . . such independent actions had the effect of substantially assisting or encouraging the failure to test by the others.” Id. at 1174 n.100.

179. The lawyer who successfully handled the Bichler case for the plaintiff has characterized the possible effect of the application of the decision to toxic tort litigation as follows: “The potential, my friends, is enormous.” Appleson, supra note 173, at 1209.

180. Kircher, supra note 164, at 1124. “In their desire to fashion a solution to the identification problem facing toxic tort plaintiffs, courts have been rather creative in stretching the boundaries of tort law far beyond intended or logical limits.” Id.


were successful in joining a substantial share of the DES manufacturers,\textsuperscript{183} then the burden would shift to each defendant to show that it had not done anything to cause the plaintiff’s injuries.\textsuperscript{184} Each defendant that failed to exonerate itself faced liability on the basis of its proportionate share of the DES market;\textsuperscript{185} thus, the court dispensed with the requirement of establishing which manufacturer specifically caused the plaintiff’s harm.

Applying the market share analysis to toxic tort litigation leaves mixed feelings. That it may facilitate the plaintiff’s causation burden in an otherwise impossible situation is clear. Dispensing with the specific causation requirement when the injured party simply joins a substantial share of the polluters would be a significant development in the area of environmental tort liability. The likelihood, to be sure, of a polluter’s disproving the causal relationship between its conduct and the plaintiff’s injury is virtually nil. Some pundits have questioned the market share theory, however, stating that it in essence permits “‘Peter to be blamed for the harm caused by Paul’.”\textsuperscript{186} As a consequence, the argument continues, the market share theory tends to undermine severely the reasonable expectations of the defendants as to the extent of liability they will suffer for their conduct.\textsuperscript{187} On the other hand, market share liability appears to be a sound expression of public policy. First, the innocent plaintiff who is uncertain about the party responsible for inflicting injury is not absolutely foreclosed from recovery. Second, the threat of market share liability can serve to deter a defendant from failing to exercise due care.\textsuperscript{188} Third, liability only attaches in proportion to each firm’s risk contribution.\textsuperscript{189} This same argument applies with equal force to imposing market share liability upon those who commit environmental torts.\textsuperscript{190} Thus, the market share theory of \textit{Sindell}, as well as the

\textsuperscript{183} 26 Cal. 3d at 612, 607 P.2d at 937, 163 Cal. Rptr. at 145. The exact meaning of “substantial share” remains unclear, which affects the impact of the \textit{Sindell} decision. \textit{But see Murphy v. E.R. Squibb & Sons, Inc.}, 40 Cal. 3d 672, 684, 710 P.2d 247, 255, 221 Cal. Rptr. 447, 455 (1985) (drug manufacturer that sold 10% of DES nationwide did not have “substantial” share of market that would shift burden of proof on issue of causation to defendant). By joining a substantial share of the defendants in the lawsuit, the plaintiff theoretically enhances the probability that one of the joined manufacturers did in fact manufacture the DES that caused the plaintiff’s injuries. In \textit{Murphy} the court noted that the requisite level of probability was absent, stating that: “there is only a 10 percent chance that it produced the drug causing plaintiff’s injuries, and a 90 percent chance that another manufacturer was the producer.” \textit{Id.}

\textsuperscript{184} 26 Cal. 3d at 612, 607 P.2d at 937, 163 Cal. Rptr. at 145.

\textsuperscript{185} The plaintiff presumably could only recover up to the total percentage of the defendants joined in the action. For example, if 90% of the manufacturers were joined, then only that percentage of the damages could be recovered. What happens in regard to the other 10% of the market and, hence, to the damages is unknown. In \textit{Martin v. Abbott Laboratories}, 104 Wash. 2d 581, 689 P.2d 368 (1984), the court expressed strong apprehension that the market share concept announced in \textit{Sindell} would lead to assignment of the unaccounted 10% to the parties before the court. 689 P.2d at 381.

\textsuperscript{186} Schwartz & Means, \textit{supra} note 153, at 1104 n.70.

\textsuperscript{187} \textit{Id.} at 1104; \textit{see also Sheffield v. Eli Lilly & Co.}, 144 Cal. App. 3d 583, 192 Cal. Rptr. 870 (1983), \textit{cited in} Rosenberg, \textit{supra} note 6, at 868 n.70 (court refused to apply the market share theory).

\textsuperscript{188} Rosenberg, \textit{supra} note 6, at 868.

\textsuperscript{189} \textit{Id.}

\textsuperscript{190} \textit{See id.} The author notes that courts have limited market share liability to generic products uniformly marketed by two or more manufacturers, but he states emphatically that
concert of action theory of Bichler, appear to be ripe for constructive utilization in toxic tort litigation.\footnote{191}

4. Last Injurious Exposure Rule

In the category of toxic torts involving harmful occupational exposures to toxic substances or hazardous wastes\footnote{192} an innovative concept, the last injurious exposure rule, has been employed in workers' compensation cases to circumvent the difficulties present when a plaintiff is unsure of the exact cause of the disease.\footnote{193} This rule imposes liability on an employer when the plaintiff was last exposed to a hazardous material, bearing a causal relation to the plaintiff's disability, during employment.\footnote{194} The principle is not one based on greater probability,\footnote{195} but is actually a rule of convenience.\footnote{196} Consequently, as a matter of policy, this rule effectively serves to lessen, if not efface, the plaintiff's burden of proving legal causation.\footnote{197}

Although the last injurious exposure exception has augmented the plaintiff's chances of recovery in occupational asbestos exposure cases, some policy considerations augur against its general utility. For example, a very significant risk exists that the rule can work to the disadvantage of an employer who was the injured employee's last employer, but for whom the employee worked only a relatively short period of time. Absent prescribed minimum lengths of time for employment, a palpably inequitable result can ensue in the case of the last, but short-term, employer.\footnote{198} Given this risk, some jurisdictions have implemented measures designed to protect an employer from being unfairly subjected to liability. Among these measures are statutory provisions establishing a minimum period of employment before

\footnote{191. \textit{But see} Epstein, \textit{supra} note 94, at 1378-82 (points out fallacious nature of market share theory as now applied to tort law).

192. The primary types of toxic or hazardous exposures are occupational, environmental, and consumer product. Schwartz & Means, \textit{supra} note 153, at 1094. The majority of claims have their genesis in an occupational setting. \textit{Id.} Thus, "[w]orker's compensation . . . is, at present, the form of administrative remedy most often relied upon in cases of toxic substance poisoning." Soble, \textit{A Proposal for the Administrative Compensation of Victims of Toxic Substance Pollution: A Model Act}, 14 \textit{Harv. J. on Legis.} 683, 714-15 (1977) (footnote omitted).


194. \textit{Id.} at 1309.

195. The factual circumstances underlying the application of the last injurious exposure rule do not meet either the "but for" or "substantial factor" tests for causation-in-fact. At best, the evidence simply establishes a causal link, falling short of the requirements for the concept of legal causation-in-fact. \textit{See} Calabresi, \textit{supra} note 14, at 72.


197. Note, \textit{supra} note 24, at 1310. This substitute for specific causation ostensibly furthers the policy of enhancing the remedial goal of workers' compensation systems, that employees should recover for those injuries arising out of and in the course of employment. To this end, the last injurious exposure rule virtually obviates the plaintiff's burden of showing a causal connection between the work and the injury. \textit{Id.}

liability can be imposed upon an employer\textsuperscript{199} or permitting employers to require medical examinations for potential employees, thus increasing the likelihood of screening out those prospective employees who already have disabling workplace-related illnesses.\textsuperscript{200}

The last injurious exposure rule is limited to a special disease (asbestos-related ailments), a special place (the occupational environment), and a special forum (workers' compensation). This combination of factors probably accounts for the courts' willingness to adopt an extremely ersatz rule of causation. Even in this narrow context, however, courts and lawmakers have carved out limitations to avoid imposing unfair liability upon an employer, indicating the uneasiness associated with this substitute for specific causation. Thus, one cannot reasonably conceive of the last injurious exposure rule, or a variant thereof, being transferred to other areas of toxic or hazardous exposure, such as environmental or consumer product cases. The last injurious exposure rule seems factually ill-suited for enviromental or consumer product cases, and more importantly, policy considerations seem to militate against its application. The need to protect the defendant from unwarranted liability in instances of environmental exposure or consumer product exposure resulting from the invocation of the last injurious exposure rule probably overshadows the interest in allowing an innocent plaintiff to recover.\textsuperscript{201} Thus, the rule has little utility in environmental or consumer product exposure areas and courts have accordingly restricted its application to a small sphere of toxic tort litigation.

5. Enterprise Liability Theory

Courts have occasionally used the novel approach of enterprise liability in an effort to help plaintiffs meet the causation burden of proof.\textsuperscript{202} The pioneer case in this area is \textit{Hall v. E.I. Du Pont de Nemours & Co.}\textsuperscript{203} In \textit{Hall} some exploding blasting caps injured the plaintiffs, who later sued several

\textsuperscript{199} \textit{IDAHO CODE} \S\ 72-439 (1973) (60 days); \textit{IND. CODE ANN.} \S\ 22-3-7-33(a) (Burns 1974) (60 days in asbestos exposure cases); \textit{PA. STAT. ANN. tit. 77, \S\ 1401(g) (Purdon Supp. 1986) (6 months).}

\textsuperscript{200} Note, \textit{supra} note 24, at 1309.

\textsuperscript{201} A strong policy favors the compensation of employees for work-related injuries. In support of this policy, states have enacted workers' compensation laws that generally dispense with the requirement of proving fault and disallow the defenses of assumption of the risk, contributory negligence, and the fellow servant rule. A. \textit{LARSON, supra} note 114, \S\ 4.50 (1985). Moreover, causation requirements have traditionally been relaxed in the workers' compensation area. \textit{See} R. \textit{EPSTEIN, C. GREGORY & H. KALVEN, JR., CASES AND MATERIALS ON TORTS} 918 (4th ed. 1984). Add to this the fact that courts are now very aware of the health and environmental risks of asbestos within the narrow confines of the workplace, and the reason why courts have liberally applied the last injurious exposure to work-related asbestos injuries becomes evident. That the rule will likely be restricted to this factual context, however, is equally apparent.

\textsuperscript{202} The Federal Product Liability Act, proposed by Senator Kasten, may adversely affect the concept of enterprise liability. Phillips, \textit{supra} note 162, at 1173. For the time being, however, this concern is moot because Senator Kasten's bill failed to get out of the Senate Commerce Committee, on a tie vote, in May 1985. \textit{Product Liability Bill Fails, supra} note 162, at 244.

\textsuperscript{203} 345 F. Supp. 353 (E.D.N.Y. 1972).
manufacturers of the blasting caps. The plaintiffs faced a dilemma common in cases of this nature: they could not identify the manufacturer of the blasting caps that actually caused them harm. As a consequence, the plaintiffs sued a limited number of defendants who manufactured blasting caps under "substantially similar industry-imposed safety standards." 204

Under the enterprise liability theory espoused in Hall, the industry-wide standard caused the injury, so that each defendant that used the standard contributed to and was liable for the plaintiff's injury. 205 Enterprise liability thus is a hybrid theory combining elements of alternative liability and concert of action. 206 The court in Hall, however, imposed restraints upon the enterprise liability theory by ostensibly limiting its application to those situations not involving a large number of companies in the particular industry. 207 Hence, one must consider not only the substantive elements of the enterprise liability theory, 208 but also its practical limitations in determining the full extent of its applicability to the area of toxic tort litigation. To date, the courts have not specifically embraced enterprise liability in an environmental tort case. In fact, courts have specifically rejected enterprise liability in DES exposure litigation, primarily because the nature of the DES industry does not lend itself to the imposition of industry-wide, or enterprise, liability. 209

Some indication exists, however, that toxic substance injuries resulting from exposure to air or water contaminants may invite the application of the enterprise liability theory. In fact, the court in Hall alluded to this possibility. 210 The extension of this theory of joint liability to those cases of air or water pollution involving an industry composed of a small number of units and pollution that is truly an enterprise risk seems reasonable. 211 Surely, industries can most effectively guard against air and water pollution; this is a compelling reason for applying enterprise liability. 212 No court decisions, however, have unequivocally reached this conclusion. Moreover, whether Hall, in its present unadulterated state, would apply to enterprise liability in

205. Id.
207. 345 F. Supp. at 378; see Note, Causation, supra note 38, at 673. The existence of a large number of companies undermines the inference that there was industry-wide control of the risk, the principal basis of the enterprise theory of joint liability.
208. To establish the enterprise liability theory, one must demonstrate that: "(1) plaintiff's injury is the result of a business generated risk, (2) the risk is best ascertained by the industry working together or through trade associations, and (3) the risk is best resolved or avoided by the industry working together." Note, Causation, supra note 38, at 673.
209. See Collins v. Eli Lilly Co., 116 Wis. 2d 166, 342 N.W.2d 37, 47 (1984); Sindell v. Abbott Laboratories, 26 Cal. 3d 588, 609, 607 P.2d 924, 935, 163 Cal. Rptr. 132, 143, cert. denied, 449 U.S. 912 (1980). The principal basis for rejecting the enterprise liability theory in Collins and Sindell was that a large number of drug companies composed the DES industry. Collins, 342 N.W.2d at 47; Sindell, 26 Cal. 3d at 609, 607 P.2d at 935, 163 Cal. Rptr. at 143.
210. See 345 F. Supp. at 377; Note, Causation, supra note 38, at 674.
211. Acid rain is a type of air pollution that may be within the pale of the enterprise liability theory. See Note, Causation, supra note 38, at 673-75.
212. See 345 F. Supp. at 377.
a water or air pollution context is unclear, notwithstanding suggestive dictum to that effect.213 Thus, the law on this point is not as well-stated as Hall might give one reason to believe. The status of the enterprise liability theory as a practical alternative to the traditional tort element of causation in fact remains dubious.

6. The Duration and Intensity Theory

Another ingenious method of imposing liability for toxic exposure injuries when no proof of legal causation exists is the duration and intensity theory.214 The fundamental premise of this theory is that to avoid establishing specific causation the plaintiff need only show that the "aggravation of the disease or . . . the exposure was of such duration and intensity that it generally causes the disease in question, even though actual causation or aggravation cannot be established in the claimant's case."215 Clearly, this principle, which originated in Caudel-Hyatt, Inc. v. Mixon,216 an asbestos-related workers' compensation case, spurns the possibility of foreclosing a victim of an asbestos-related illness from recovering because of inability to meet the difficult, if not impossible, burden of proving actual causation. Instead, the plaintiff needs to prove only the duration and intensity of the exposure.217

Misgivings arise as to the effectiveness of the duration and intensity approach as a palliative to the traditional tort causation rule in the broad spectrum of toxic or hazardous exposure cases. The less demanding duration and intensity test may be palatable in the well-understood area of asbestos-related maladies.218 Consequently, courts may be more receptive to assuasive devices that circumvent the harsh ramifications of specific causation in these exposure cases, for more is known about the etiology of asbestos-related diseases, and correspondingly less has to be shown with respect to causation to convince a court of the merits of recovery. To the contrary, scientific uncertainty still pervades most other hazardous waste or toxic substance exposure injuries. Thus, in these types of toxic torts, courts may reject a lenient approach like the duration and intensity theory.219 Even if courts do not totally reject this theory, plaintiffs would have a greater burden of proving duration and intensity of exposure than plaintiffs in asbestos cases.220

213. Id. Using Hall as authority presents a problem, however, in that the cases that the Hall court cites to support application of the enterprise liability theory to air and water pollution are not enterprise liability cases. Note, Causation, supra note 38, at 674.
214. Note, supra note 24, at 1312.
216. Id.
217. Note, supra note 24, at 1311.
218. Id. at 1312.
220. Note, supra note 24, at 1313. In addition to the more onerous requirement with re-
7. Proportionality Rule

Another alternative to traditional tort causation principles is causation established on the basis of the proportionality rule, a species of comparative causation.\(^{221}\) Under this alternative to specific causation manufacturers or other generators of toxic substances or hazardous wastes are liable for injury to the exposure victim in proportion to the damage caused by the tortious conduct of each.\(^{222}\) The practical utility of the proportionality rule is two-fold. First, this rule dispenses with the traditional common law rule that requires the plaintiff to establish causation-in-fact by the preponderance of the evidence.\(^{223}\) Under the proportional liability rule courts can impose liability and grant compensation in proportion to the causation probability of the excess disease risk\(^{224}\) in the affected population. Courts need not consider whether the causation probability is above or below the fifty-percent threshold or if an individual plaintiff proved a causal connection.\(^{225}\) Second, the proportionality rule resolves the causal indeterminacy problem in mass exposure cases.\(^{226}\) Exposure victims can recover for some of their injuries even though they may not know the substance causing their disease or the identity of the responsible party.\(^{227}\) Eliminating the preponderance of the evidence rule and requirements of specific causation in toxic or hazardous exposure cases will further the goals of tort law. Allowing a plaintiff to recover without establishing a causal probability in excess of fifty percent, while, at the same time, not having to offer particularized proof of causation removes a formidable barrier to recovery. In so doing, the proportionality rule advances the traditional tort law goals of compensation, deterrence, and corrective justice.\(^{228}\) The proportionality rule may very well be an appropriate response to the causation conundrum.\(^{229}\) The rule simply revamps current tort thinking, and, in so doing, perhaps offers a viable alternative to

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\(^{221}\) Rosenberg, supra note 6, at 866.

\(^{222}\) Id.

\(^{223}\) Prosser, supra note 16, § 38, at 239. A highly artificial, sometimes unfair, situation commonly characterized as the all-or-nothing causation rule has developed under the preponderance of the evidence rule. Essentially the plaintiff wins if he demonstrates that the probability of causation exceeds fifty percent, but loses completely if the probability is fifty percent or less. This system does not appear to foster accepted tort objectives.

\(^{224}\) Excess disease risk means the “disease incidence attributable to the ‘excess risk’ created by the toxic agent” in question, in contrast “to the ‘background risk’ —the cumulative risk attributable to all other factors.” Rosenberg, supra note 6, at 857.

\(^{225}\) Id. at 859.

\(^{226}\) Id. at 866.

\(^{227}\) Normally, these are the thorniest problems confronting a toxic or hazardous tort exposure victim. See supra notes 143-47 and accompanying text.

\(^{228}\) See Robinson, Probabilistic Causation and Compensation for Tortious Risk, 14 J. LEGAL STUD. 779, 783-91 (1985); see also Rosenberg, supra note 6, at 866 (rule enables system to achieve optimal deterrence objective). But see Elliott, Why Courts? Comment on Robinson, 14 J. LEGAL STUD. 799, 804-05 (1985) (endorses probabilistic causation approach, but eschews goal analysis of Robinson in preference for an institutional analysis).

\(^{229}\) See Laub, The Application of Enterprise Liability to Asbestos-Related Litigation, 17 TRIAL 58 (1981); Rosenberg, supra note 6, at 866-68, 881-87.
abandoning the tort system.\textsuperscript{230}

8. Other Possible Modifications of the Specific Causation Rule

\textit{a. Sliding Scale Concept.} A few lesser known, but provocative, alternatives have also been advanced to alleviate the harshness of the specific causation principle. One of these alternatives is the sliding scale concept. Under this approach, the degree of proof required to establish causation varies with the risks and benefits of the allegedly harmful activity.\textsuperscript{231} Thus, if the activity entails some extraordinarily great risks with concomitantly miniscule societal benefits, then the burden of proof on the issue of causal connection is relaxed.\textsuperscript{232} Conversely, an activity involving highly important social benefits with correspondingly lower attendant risks will probably result in the imposition of more stringent proof requirements for causation.\textsuperscript{233}

Although at first blush this sliding scale or risk-benefit theory of causation seems to present a solution to the causation problem in the field of toxic torts, serious reflection reveals that the theory is not a solution. The troublesome areas include: (1) the inherent difficulty for the courts to make reasonably precise determinations of cost-benefit and risk-benefit ratios in convoluted environmental tort cases,\textsuperscript{234} and (2) the propensity of injured parties to fabricate the degree of the risk involved in an attempt to ensure that courts will apply a lower burden of proof on causation issues in the litigation.\textsuperscript{235} This theory undermines the torts process in two significant aspects: first, the arduous task of precisely measuring and balancing risks against benefits inherently entails the strong possibility of error by a court;\textsuperscript{236} second, the injured party’s tendency to exaggerate the magnitude of

\textsuperscript{230} Rosenberg, \textit{supra} note 6, at 928. The possible virtue in overhauling the tort system as opposed to totally abandoning it is that the tort system is both well-tested and well-proven. Hence, it "may nevertheless be serviceable for the time being—with the installation of some modern equipment." \textit{Id.} at 929. See infra notes 291-92 and accompanying text for a contrary view.

\textsuperscript{231} Trauberman, \textit{supra} note 19, at 225.

\textsuperscript{232} \textit{Id.}

\textsuperscript{233} On its face, the sliding scale or risk-benefit approach to causation seems workable. For years courts have engaged in some form of risk-benefit analysis to establish negligence under tort law, \textit{see, e.g.}, United States v. Carroll Towing Co., 159 F.2d 169, 173 (2d Cir. 1947), or to ascertain whether certain activity constitutes a nuisance, \textit{see, e.g.}, Copart Indus., Inc. v. Consolidated Edison Co., 41 N.Y.2d 564, 572, 362 N.E.2d 968, 974, 394 N.Y.S.2d 169, 175 (1977) (Fuchsberg, J., dissenting) ("[n]uisance traditionally requires that, after a balancing of the risk-utility considerations, the gravity of harm to a plaintiff be found to outweigh the social usefulness of a defendant’s activity"). In nuisance actions this balancing is generally apposite to the question of whether a use or activity is reasonable, a fundamental question in this area of tort law. The issue of social utility versus risk likewise arises in the context of injunctive relief sought in connection with nuisance actions. See Spur Indus., Inc. v. Del E. Webb Dev. Co., 108 Ariz. 178, 494 P.2d 700, 706-08 (1972); Boomer v. Atlantic Cement Co., 26 N.Y.2d 219, 224-26, 257 N.E.2d 870, 872-73, 309 N.Y.S.2d 312, 315-17 (1970). These two cases illustrate the application of risk-benefit analysis in nuisance law. The primary remedial question in both cases was the propriety of either injunctive relief or damages. In view of the case law, an activity may be unreasonable for the purpose of awarding damages, although injunctive relief is not available because of the activity’s great social utility.

\textsuperscript{234} Trauberman, \textit{supra} note 19, at 225.

\textsuperscript{235} \textit{Id.} at 224.

\textsuperscript{236} In environmental law, for example, in which risk-benefit analysis is commonly used, a
the particular risk leads to the untenable situation of an innocent party quite possibly being saddled with a loss that he or she did not cause. This injustice can easily occur when a court possesses less than the desired level of competence to perform its task so that exaggerated claims of great risks easily sway the court, effectively relaxing the plaintiff's burden of proof with respect to causation. The sliding scale approach to causation is fraught with both scientific and legal uncertainty. Although the approach works to the advantage of the exposure victim, its advantages are unacceptably low when compared to its possible detriment.

b. Inferences and Presumptions. Permissible inferences and presumptions, or mandatory inferences, have traditionally been employed to facilitate the plaintiff's burden of proof in a variety of instances. Between the two, perhaps presumptions are potentially more useful to the exposure victim in a toxic tort case. A major complication in toxic tort litigation is establishing the causal connection between hazardous substance exposures and later manifested injuries. Of prime concern is whether a presumption of causation is an appropriate method of alleviating this problem. Since shifting the burden of going forward to the defendant, the normal procedural effect of a presumption, enhances the likelihood of compensation, the toxic tort victim should welcome presumptions as a valuable tool. Moreover, if this burden...
den shifting should tend in some way to elevate the credibility of epidemiological proof in establishing the requisite causal connection in toxic tort litigation, then, here again, this shift will be an exceedingly significant development toward securing adequate victim compensation. Specifically, epidemiological evidence that reflects a rise in the incidence of the exposure victim's disease in the exposed population at the rate of fifty percent may be sufficient to raise a presumption that the exposure in question caused the particular victim's disease. This prima facie case of causation effectively shifts the burden of going forward on the issue to the defendant. Because, as a practical matter, the causation question is thorny for whoever shoulders the responsibility, a defendant suddenly saddled with the rebuttal burden may be unable to meet it. Failing this, the toxic tort victim may prevail regarding causation on the basis of epidemiological evidence that heretofore would generally have been patently insufficient. More significantly, the exposure victim will avoid the responsibility of establishing specific causation, the bane of almost every toxic exposure victim seeking compensation today. The spectre of this eventuality understandably intimidates some individuals.

From a policy perspective the real issue underlying the presumption/causation controversy is the proper allocation of the risk of loss in toxic tort exposure cases. In view of current social and economic conditions in

243. See id. To date, however, courts have not given epidemiological proof much credence in the causation issue. See Note, supra note 1, at 584.

[T]he evidence may show a statistical increase in the occurrence of [this disease] in a population exposed to the toxic substance. But such evidence says little about the cause of the plaintiff's particular injury: Unless that statistical increase is greater than 100%, his injury probably was not caused by the exposure, and he will recover nothing.

Id. at 583-84 (emphasis in original).

244. If the defendant fails to adduce sufficient evidence to overcome the presumption of causation, then, generally, the plaintiff exposure victim has established causation by a preponderance of the evidence. Note, supra note 1, at 584 n.32. Some opposition to using presumptions to alleviate the exposure victim's causation burden exists. As one report concluded:

The use of presumptions to aid a plaintiff's proof of causation in toxic exposure cases is highly controversial. Advocates believe presumptions enable claimants to make their case despite the absence of clear medical evidence regarding the cause of an illness. Opponents believe presumptions should not be employed when the cause of an illness is medically attributable to more than one source or is unknown. These positions reflect two very different views toward the role presumptions should play in a trial. Those favoring presumptions believe they should be used to resolve doubt in favor of an injured individual. Opponents believe they should not be used to resolve issues legitimately in doubt but only to remove barriers created by practical problems of proof such as the excessive cost of amassing pertinent scientific data.


245. AMERICAN ENTERPRISE INSTITUTE FOR PUBLIC POLICY RESEARCH, supra note 244, at 19 (argument that courts should not employ presumptions when cause of an illness is attributable to more than one source or is unknown).

246. Without presumptions, plaintiffs have an extremely difficult time meeting traditional requirements of proving that a particular substance was in fact the cause of the illness. Similarly, however, a defendant will probably be just as unable to
our society the policy pendulum should swing in favor of the exposure victim who is in a less favorable position to protect himself or herself from the exposure and, moreover, generally possesses fewer resources to bear the costs of the loss ensuing from the harmful exposure. The use of presumptions to assuage the causation problems of an exposure victim will foster the tort goals of compensation, deterrence, and corrective justice between the parties.

c. Class Action Mechanism. The scientific, medical, and legal problems associated with establishing causation in toxic tort litigation pose a major pragmatic concern for the exposure victim: the astronomical costs that one must incur simply to litigate the causation question. The prospect of staggering litigation costs, including attorney's fees, may have the untoward effect of denying many meritorious exposure claims access to the courts on the basis of sheer economics. The class action mechanism may be an appropriate method of making the causation determination in toxic tort cases a financially feasible undertaking for exposure victims. Rather than having to replicate a number of costly individual determinations of causation, the class action approach allows the consolidation of a number of generically related cases, quite possibly resulting in tremendous resource savings.

Nevertheless, the apparent attractiveness of the class action apparatus to ameliorate costs attendant to litigating the causation question in the field of toxic torts is not universally accepted. Courts invariably decline to permit the certification of class actions in mass tort cases. The principal explana-

prove the substance was not the cause, so that overcoming a presumption can be difficult and can mean the defendant will bear the cost of the inability to prove causation.

Id. at 20 (emphasis in original).

247. Several social and economic conditions call for a policy tilted in favor of the exposure victim. First, human exposure to hazardous or toxic wastes is one of the most pressing health and environmental concerns in society today. Second, making the prospect of liability for victim compensation more likely is a method for deterring those who might indiscriminately create hazardous exposure risks by violating waste management laws. Finally, because of a polluter's ability to externalize costs, pollution is actually an economically efficient activity without the deterrent effect of granting victim compensation. See Hardin, The Tragedy of the Commons, 162 SCIENCE 1243, 1244-45 (1968).

248. The number of scientists, epidemiologists, and field and laboratory studies required to establish causation demonstrate that a vast investment of money, time, and human resources is generally unavoidable. See SUPERFUND SECTION 301(e) STUDY GROUP, SENATE COMM. ON ENV'T & PUB. WORKS, INJURIES AND DAMAGES FROM HAZARDOUS WASTES—ANALYSIS AND IMPROVEMENT OF LEGAL REMEDIES, S. REP. NO. 12, 97th Cong., 2d Sess. (1982).

249. As alternatives to the traditional tort system, compensation systems that skirt scientific uncertainty have the potential to be much less expensive, cumbersome, and time-consuming. See Abraham & Merrill, Scientific Uncertainty in the Courts, 2 ISSUES SCI. & TECH. 93, 106 (1986). Defendants have a decided advantage in this situation because once they develop the issue of causation, that evidence can be used in subsequent cases. Redundancy for defendants is, for the most part, economically efficient.

250. Rosenberg, supra note 6, at 908. "Class treatment of mass exposure claims would enable plaintiff attorneys to achieve the same economies of scale that defendants already enjoy." Id.

251. Id.

tion given for the courts' reluctance is that class actions treat claims in a mass production manner that fails to recognize differences among claimants. This reasoning, however, may be inapposite to the causation issue in toxic tort cases because particularized evidence with significant probative value seldom exists in an individual case. The likelihood of a court's not being appropriately sensitive to the differences in the cases, therefore, is virtually nil because usually no real distinctions exist. The cases are virtually the same in terms of the difficulty of proving causation. Given the arduousness of establishing causation and the vast expenses associated with the effort, class actions thus may be an economically prudent way to marshal scarce resources in an assault upon this problematical aspect of toxic tort litigation.

D. The Medical Causation Issue

I. General Discussion of the Salient Aspects of Medical Causation

As one commentator has noted, scientists find identifying the precise cause of toxic tort injuries extremely difficult. In addition to the troublesome question of legal causation, one must wrestle with another component of the causation calculus in toxic tort litigation: the medical causation factor. Causal uncertainty and indeterminacy greatly undermine the assessments of medical scientists. For this reason, medical causation theory has drifted from the well-nigh impossible task of establishing causation by direct evidence to a position that focuses upon risk assessment and probabilities of causation. Inferences of causation arise from epidemiological or toxico-
logical studies that statistically establish a likely causal relationship between the exposure and the harm.\textsuperscript{259} Unfortunately, the statistical cause and effect relationship established by such scientific evidence is uncertain to a degree generally considered to be unacceptable in the field of legal causation.\textsuperscript{260}

2. Melding Legal and Medical Causation

Because the proof of a scientifically valid relationship does not always meet the legal causation standard, courts may, and sometimes do, reject proffers of proof consisting of scientific data that may establish medical causation, but fall short of the standards for legal causation.\textsuperscript{261} This disaccord in the association of science and law prevents plaintiffs from establishing causation.\textsuperscript{262} Perhaps some kind of reform should be instituted to modify the concept of legal causation to bring it in line with the realities of medical causation.\textsuperscript{263} Specifically, utilizing the scientifically inspired probability of causation approach to allow plaintiffs to establish legal causation on the basis of evidence reflecting causation probabilities of fifty percent or less will greatly enhance the exposure victim's chances of recovery. More importantly, however, such an approach squarely confronts the reality of the complexity and uncertainty of proof in toxic tort litigation in which the degree of certainty required under current legal causation principles is virtually impossible to achieve.\textsuperscript{264} If scientific, that is, medical, principles of causation are used to supplement the concept of legal causation, this interrelationship of law and science will strengthen the exposure victim's ability to establish the requisite causal relationship between exposure and harmful injury.\textsuperscript{265} Bridging the gap between legal causation and medical causation is undeniably a sound means to smooth the exposure victim's otherwise rocky causation

\textsuperscript{259} See Note, supra note 23, at 820. "[B]efore risk assessment can be conducted two critical components must be satisfied. First, the toxicity of the substance must be measured and, second, the extent of human exposure to the substance must be established." \textit{Id.} at 817.

\textsuperscript{260} \textit{Id.} at 814. "This gap between the medical acceptance of some uncertainty in causation and legally certain causation is itself a major obstacle to recovery in a hazardous waste injury suit." \textit{Id.} at 825. Unlike medical causation, tort law does not countenance causal uncertainty. The mere possibility of causation is not enough to establish legal causation, although this possibility may be adequate to establish medical causation. \textit{Id.} at 821-22. Thus, "[i]f an expert witness fails to testify to a reasonable medical probability of causation, the plaintiff will suffer a directed verdict or fail to convince a jury that legal causation exists." \textit{Id.} at 832. Reasonable medical probability or certainty is, therefore, coterminous with the preponderance of the evidence standard. \textcite{McElveen & Eddy, supra note 23, at 47.}

\textsuperscript{261} \textit{Id.} at 844 (proposes modification of legal causation concept to align with medical realities of hazardous waste injuries).

\textsuperscript{262} See Note, \textit{The Burden of Proof}, supra note 19, at 207-08.\textsuperscript{263} The mere probability of a causal association between the exposure and the injury will therefore suffice to establish legal causation; this will greatly diminish the onus on the exposure victim and, as importantly, elevate scientific data to a more respected position in proving causation in toxic tort litigation.
road, and thus, it would represent a prudent policy step toward the adequate compensation of victims of exposure to toxic substances or hazardous wastes.

E. The Future Interdisciplinary Roles of Law, Medicine, and Science in Resolving the Toxic Tort Causation Conundrum

Toxic substance and hazardous waste exposure torts present extraordinary scientific, medical, and legal problems.\(^{266}\) Thus, by force of circumstances, society should give serious thought to developing the framework for an effective interrelationship between law, medicine, and science to address squarely the causation question in toxic tort litigation.\(^{267}\) Because toxic tort litigation is invariably hybrid in nature,\(^{268}\) any problem-solving forum, be it judicial, administrative, or legislative implicates a number of perspectives.\(^{269}\) The formidable challenge is synthesizing the causative concepts of law, medicine, and science to fashion a workable theory of causation for toxic tort litigation. Such a theory should vindicate the tort law goals of compensation, deterrence, and corrective justice between the parties.\(^{270}\)

The development of a proper theoretical framework to address causation issues in toxic tort cases is urgent.\(^{271}\) To ameliorate the harshness of the causation requirement, significant, but not radical, changes must be incorporated into the proof calculus. In the context of law, medicine, and science,
courts must become discriminatingly receptive to epidemiological and other scientific data in resolving toxic tort claims.\(^\text{272}\) Currently, however, the attitudes of the judiciary toward statistical evidence may lead to the defeat of toxic tort claims.\(^\text{273}\) Some courts have cast aspersions on this type of evidence by characterizing it as hearsay, thus making it inadmissible.\(^\text{274}\) The bias against statistical evidence arising out of epidemiological studies is multifaceted. First, because statistics can be manipulated, an aura of uncertainty surrounds the use of epidemiological evidence.\(^\text{275}\) Second, statistical evidence emanating from epidemiological studies is by its very nature a population group study and not an individual study. This evidence does not necessarily shed light upon the cause of an individual's injury.\(^\text{276}\) Third, given that epidemiological proof may establish a statistical causal relationship, courts must still determine whether, within a reasonable medical certainty, that is, more likely than not, a particular person developed his or her injury from the source in question.\(^\text{277}\) The key to reconciling law, medicine, and science regarding the causation question is to overcome barriers erected by these widespread judicial predilections.\(^\text{278}\)

To accomplish this objective science and law must complement each other

\(^{272}\) Id. Enhanced judicial responsiveness to epidemiological and other scientific evidence, however, will not necessarily be an Elysium for exposure victims. In a series of cases stemming from Vietnam veterans’ exposure to Agent Orange, a federal district court countenanced the value of epidemiological evidence, but repeatedly concluded that it did not reflect “that paternal veteran exposure to Agent Orange causes birth defects or miscarriages.” \textit{In re Agent Orange Prod. Liab. Litig.}, 603 F. Supp. 239, 246-47 (E.D.N.Y. 1985); see also \textit{In re Agent Orange Prod. Liab. Litig.}, 611 F. Supp. 1223, 1231 (E.D.N.Y. 1985) (no data shows causal connection between exposure to Agent Orange and serious adverse health effects). In this case, instead of buttressing the position of the plaintiff, the district court appraised the epidemiological evidence as plainly indicating that “Agent Orange cannot now be shown to have caused plaintiffs’ numerous illnesses.” \textit{Id.} at 1241. To exacerbate matters, the expert affidavits that the plaintiffs presented fell far short of counteracting the virtually unswerving epidemiological proof proffered by the government. For an in-depth evaluation of the weaknesses of the plaintiffs’ expert and epidemiological cases see \textit{id.} at 1235-36. The plaintiff’s bane is inadequacy of proof of causation. \textit{See} \textit{In re Agent Orange Prod. Liab. Litig.}, 611 F. Supp. 1290, 1295 (E.D.N.Y. 1985); \textit{In re Agent Orange Prod. Liab. Litig.}, 611 F. Supp. 1285, 1289-90 (E.D.N.Y. 1985); \textit{In re Agent Orange Prod. Liab. Litig.}, 611 F. Supp. 1267, 1279 (E.D.N.Y. 1985); \textit{In re Agent Orange Prod. Liab. Litig.}, 597 F. Supp. 740, 782 (E.D.N.Y. 1984).


\(^{274}\) Comment, \textit{A Private Nuisance Approach to Hazardous Waste Disposal Sites, 7 OHIO N.U.L. REV. 86, 100 (1980).} The argument generally raised against epidemiologic statistical proof, for example, is that the proof is simply based on probabilities and hence is inherently imprecise. McElveen \& Eddy, \textit{supra note} 23, at 66. Also, “problems of authenticity and cross-examination” are present in connection with epidemiological studies. \textit{Id.} at 59.

\(^{275}\) McElveen \& Eddy, \textit{supra note} 23, at 59. “[S]tatistics may be probative. However, they can also be manipulated, thereby undermining the probative value and reliability of the conclusions drawn.” \textit{Id.}

\(^{276}\) \textit{Id.} at 60. For a legal system wedded almost inextricably to the concept of specific causation “the question still remains: did the substance or agent in question cause the disease in the particular person in whom the legal system is interested?” \textit{Id.} at 47.

\(^{277}\) \textit{Id.}

even though lawyers and scientists view the world from radically different perspectives. How do we achieve this sorely needed symbiotic relationship between lawyers and scientists? If we are able to achieve some sort of rapprochement, how do we mold it into a positive force to foster a greater sense of understanding about the true nature of the problem of establishing causation in toxic tort litigation? This litany of seemingly complex questions may have a simple answer: the two groups should simply begin to communicate effectively with each other. From these improved lines of communication a better understanding of the respective disciplines and an enhanced awareness of the differences and similarities in their analytical approaches will probably ensue. More importantly, this mutual understanding would act as a catalyst for the formation of a rational and effective system of regulation and safety management. A palatable compensation process for toxic substance exposure-related diseases and injuries could also result from this essential cross-fertilization.

IV. A PROPOSED SOLUTION TO THE CAUSATION ISSUE IN TOXIC TORT LITIGATION

That causation presents imposing problems for the traditional common law tort system is axiomatic. Some commentators advocate an overhaul of the conventional tort system to deal with this pressing concern, but serious thought should be given to abdicating for the most part the traditional common law tort litigation model and replacing it with an administrative compensation scheme. Such a change in direction may have an optimal effect in terms of fostering fairness and economic efficiency in the allocation of the scarce resources available for the compensation of toxic tort injuries.

279. Todhunter, Science and Law in Chemical Regulation: Bridging the Chasm 18 (May 15, 1984) (unpublished paper presented at Conference on Hazard Evaluation and Risk Assessment, Society of Toxicologic Pathologists). The commentator theorizes that the dramatic divergence of law and science results from the law being rather static because of adherence to the concept of stare decisis, while science is more susceptible to "change as we learn and understand more about the natural world." Id. at 1.

280. Id. at 18. A prime illustration of the chaos that can arise in connection with health and safety regulation when no proper melding of law and science occurs is the field of toxic and hazardous waste management, which, ironically, is the genesis for many toxic tort suits. Unfortunately, scientists do not communicate sufficiently with the environmental regulators, many of whom are lawyers; the result borders on disaster. See Manley, Pragmatic Approach to Environmental Studies, speech presented at the Environmental Conference, University of Cincinnati (Apr. 12, 1985).

281. Todhunter, supra note 279, at 18.


283. See Trauberman, supra note 19, at 177 (predetermination of problems, apportionment, class actions, Hazardous Substance Victims' Compensation Fund, elimination of proof for compensation); Note, supra note 282, at 509 (complete restructure of tort system for compensating hazardous waste injuries).

284. The administrative scheme alternative is not a completely novel idea. For example, Professor Grad's Superfund Section 301(e) report advocates, among many dramatic proposals, that hazardous waste exposure victims have available an administrative remedy option (Tier One). SUPERFUND § 301(e) STUDY GROUP, supra note 248.
A. Why Not a Judicial Solution?

Probably the best argument against adopting a judicial solution to the causation puzzle is the judicial litigation model itself. As noted earlier,285 common law tort rules regarding the establishment of liability, including causation, developed without the intricacies of toxic tort in mind. Because of this deficiency, it is virtually impossible to recover for toxic tort injuries.286 Although tinkering with the system may alleviate the problem to some extent,287 this seems to be an improvident course of action because it ignores the obvious fact that the crux of the problem will still be extant. The conventional tort law system has judges and juries who experience great difficulty in dealing with highly technical scientific and medical issues288 that invariably are integral components of toxic tort litigation. Furthermore, the tort system has high transaction costs, most notably for fees to expert witnesses and attorneys.289 The system also has an inherent propensity to be slow, cumbersome, and protracted, denying the parties to the litigation a prompt resolution of their dispute.290

To think that a meaningful solution to the causation problem in toxic tort litigation can somehow be carved from the conventional tort system, is wishful thinking at best.291 The nuances of the causation element in toxic tort cases are just too taxing for the common law tort system, even with modification. Thus, a carefully crafted administrative compensation scheme is perforce necessary.292

285. See supra notes 143-50 and accompanying text.
286. See Note, supra note 282, at 509.
287. See supra notes 162-247 and accompanying text.
288. See In re Agent Orange Prod. Liab. Litig., 611 F. Supp. 1223, 1231 (E.D.N.Y. 1985). The court, conceding the importance of epidemiological evidence on the causation issue, wrestled almost aimlessly with deciding whether epidemiological proof and animal studies established the causal linkage between the dioxin exposure of Vietnam veterans and the diseases they allegedly suffered. See also Todhunter, supra note 279, at 16 (ability of judges and jurors to understand this information questionable).
289. A complex question like causation-in-fact carries a tremendous price tag to meet the legal proof requirements. See Note, supra note 282, at 515-16.
290. SUPERFUND SECTION 301(e) STUDY GROUP, supra note 248. The recommendations of the § 301(e) committee, however, fall short of the desired goal because they propose an administrative system aimed at supplementing, rather than supplanting, a system of legal remedies.
291. Actually, an alternative compensation system may protect traditional tort principles. See Mashaw, supra note 10, at 1393 (problem of establishing causation in toxic torts can be solved by eliminating tort system).
292. See Bartlett, The Legal Development of a Viable Remedy for Toxic Pollution Victims, 4 TOXIC SUBSTANCES I. 277. The commentator makes this observation:

Development of an alternative compensation mechanism other than traditional tort law has received considerable legislative study and attention. These studies have been virtually unanimous in concluding that existing statutory and common law allows for an unsatisfactory remedy for victims exposed to this type of injury. This is especially true for the smaller type of claims. The frequent backlog of court cases also presents a serious impediment to a satisfactory compensation scheme.

Id. (footnotes omitted); see also Trauberman, Toxic Substances and the Chemical Victim, A.B.A. ENVT. L. NEWSLETTER, Summer 1983, at 1, 2 (existing legal system not efficient or effective in handling such claims).
B. The Proposed Administrative Model

Although this administrative compensation scheme proposal hopes to en-
gender further reflection regarding the troublesome element of causation,
bear in mind that reform simply for the sake of enhancing an exposure vic-
tim's chances of recovery is not universally endorsed. Critics of compen-
sation system reform suggest that such reform is not necessary. Such
reasoning seems misguided in view of the widely espoused position that a
noticeable problem with many of the current environmental laws is their
preoccupation with prevention, rather than victim compensation. Moreover,
a carefully crafted and well-conceived administrative scheme will not
only provide a reasonable level of compensation for the exposure victim, but
will do so in a shorter period of time, with lower transaction costs, and with
a greater degree of scientific and medical accuracy. Of course, for accep-
tance, an administrative scheme must have beneficial consequences that ex-
tend not only to the injured claimant actually involved in the administrative
process, but to the whole of society as well. The attribute of this administra-
tive compensation scheme that is central to this goal will be its ability to
galvanize toxic and hazardous waste polluters to engage in activities
designed to reduce the risks associated with the generation, transportation,
and disposal of toxic and hazardous wastes.

I. The Basic Goals of the Proposed Administrative Model

Any proposed alternative to the traditional common law tort system that
is touted as a more favorable means of handling the countervailing legal,
political, and economic policy concerns in toxic tort litigation can only ac-
quire some semblance of legitimacy by providing palatable accommodation
of these competing interests. An alternative compensation scheme, whether
administrative, judicial, or some combination thereof, must strike a

293. Trauberman, supra note 292, at 1.
294. Id.
295. Comment, supra note 111, at 730. "Legislatures have geared environmental statutes
primarily to enforcement against the chemical industries and have thus provided regulatory
mechanisms at both state and federal levels. These regulatory statutes provide extensive ad-
ministrative remedies to the government, but no compensatory remedies to the injured party."
Id. (footnotes omitted); see Almond Hill School v. Department of Agriculture, 768 F.2d 1030,
1035-37 (9th Cir. 1985) (no private right of action under FIFRA nor under 42 U.S.C. § 1983
(1982)).
296. The converse is also true; an ill-advised administrative compensation scheme could
create a situation where the advantages become disadvantages. See Comment, Toxic Torts and
Chapter 11 Reorganization: The Problem of Future Claims, 38 VAND. L. REV. 1369, 1394-95
n.208 (1985) (presents general outline of victim compensation system modeled after
Superfund).
297. See Soble, supra note 192, at 730 (enumerating compensation for injured exposure
victims and risk reduction for the benefit of society as bare minimum objectives of any legiti-
mate alternative administrative compensation scheme).
298. See Ginsberg & Weiss, supra note 144, at 933-39 (outline of compensation scheme to
accommodate countervailing legal, political, and economic interests); Prince, Compensation
(study does not recommend establishment of compensation fund, but provides provocative
recommendations in case a fund is established in the future; these recommendations appear
compatible with reconciling competing legal, political, and economic concerns); see also Kahn
proper balance between the legal goals of compensation, deterrence, and corrective justice; the political goals of expediency, negotiation, compromise, and settlement; and the economic goal of maintenance of viable enterprises, which are essential to economic growth despite their potentially adverse effect on the quality of the environment and on environmental exposure victims.

2. The Administrative Framework for Achieving the Goals

The proposed administrative system for disposing of toxic tort claims must embody features that promote each of the legal goals of compensation, deterrence, and corrective justice.\textsuperscript{299} Central to this objective is the recognition that an effective compensation scheme must be national in scope, funding, and direction. The rationale for the requirement of a national scheme is that the toxic tort conundrum is simply too imposing to be handled on any smaller scale.\textsuperscript{300} What configuration should a national administrative compensation scheme take? The system should, of course, provide the most meaningful form of compensation to toxic tort exposure victims, while simultaneously fostering deterrence of purveyors of toxic and hazardous wastes and bringing about risk reduction in a manner that produces at least a rough sense of justice and fairness between the polluters and the victims of pollution. The crucial inquiry for the purpose of this Article, however, is how one gives substance and flesh to this very skeletal, but essentially correct answer.

Of primary concern is developing a scheme that guards adequately against the unsavory situation of denying recovery to an unacceptably large number of deserving toxic tort claimants because of anachronistic tort principles developed without the complexities of toxic tort litigation in mind.\textsuperscript{301} On the other hand, to have any meaningful deterrent, or risk reduction, effect, the

\textsuperscript{299} See Trauberman, supra note 19, at 177. The commentator proposes a statutory victim compensation model that fosters the tort goals of fair compensation, meaningful deterrence, and corrective justice principally through relaxation of the legal, scientific and economic burdens that normally beset the exposure victim. \textit{Id.}

\textsuperscript{300} See Ginsberg \& Weiss, supra note 144, at 930. An effective solution to the problem of victim compensation in connection with toxic torts must emanate from the federal level "since individual states will be reluctant to create a climate hostile to industry by imposing costs not existing in friendlier jurisdictions." \textit{Id.} Not only the mammoth nature of the risk, but also political and economic influences, can stifle constructive action by the states. Hence, the proposed administrative compensation scheme must be a product of federal legislation and have the imprimatur of the federal government.

\textsuperscript{301} Comment, \textit{Close Encounters}, supra note 134, at 854; see Note, \textit{supra} note 134, at 180-81; Note, Increased Risk of Cancer as an Actionable Injury, 18 GA. L. REV. 563, 564 (1984); see also Comment, \textit{Agent Orange}, supra note 134, at 67-71 (profound proof problems in connection with causation for Vietnam veterans who allegedly suffered injury from exposure to \textit{Agent Orange}). For a discussion of the causation problem in connection with \textit{Agent Orange} in the litany of \textit{Agent Orange} cases see \textit{supra} note 272. Causation is not the only formidable barrier to recovery by an exposure victim. Traditional tort statutes of limitation provisions enhance the likelihood that victims of latent injuries will be barred from a legal remedy. Note, \textit{Statutes of Limitations and Pollutant Injuries: The Need for a Contemporary Legal Response to Contemporary Technological Failure}, 9 HOFSTRA L. REV. 1525, 1527 (1981).
system must be grounded upon principles that impose liability only upon those who are the likely cause of the toxic harm underpinning the tort claim. The indiscriminate imposition of liability upon potential polluters will have an insignificant deterrent effect because it will undermine any incentive on their part to engage in any kind of behavioral modification to reduce the risk; the polluters will sense the futility of trying to insulate themselves from broad, open-ended liability. Also, the imposition of virtually unlimited liability upon polluters could have an untoward effect upon the economic growth and prosperity of many vital enterprises in the United States.

3. Specifics of the Proposed Administrative Plan

The administrative compensation scheme presented here has three principal objectives in mind: first, to compensate the exposure victim; second, to force the polluter to engage in behavioral modification ineluctably reducing the risks attendant to the disposal of toxic or hazardous wastes to a level that does not pose an imminent and substantial endangerment to human health or the environment; and third, to provide a causation formula that brings about these much needed legal and political goals at the lowest possible cost to the economic viability of enterprises that are vital to the nation's economic growth and prosperity. To accomplish these compelling, perhaps countervailing, objectives, the compensation scheme will be carefully designed in terms of the rules of liability, allowable damages, and methods of funding. The causation element of the proposed administrative compensation scheme is an important feature of the liability component.

a. Rules of Liability (Causation). At the heart of any rational suggestion for an administrative compensation scheme for toxic injuries is a legitimate framework for resolving the much discussed question of causation. Although causation-in-fact is basically a factual inquiry, policy impulses do affect its determination. As noted earlier, the foremost policy consideration for modifying traditional common law causation principles has been the

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304. A suitable causation component is a sine qua non of an administrative compensation system to strike a proper balance among the policy goals of compensation, deterrence, and corrective justice. The very integrity of a compensation system is at risk without a rational causation element. See Huber, supra note 302, at 81. Congruent with Superfund and notions of progressiveness, however, the basis of liability under this compensation system will be strict and, thus, will not hinge upon assignment of blame or fault. See supra notes 13 & 93.

305. See Malone, supra note 14, at 61. "[P]olicy may often be a factor when the issue of cause-in-fact is presented sharply for decision, much as it is when questions of proximate cause are before the court." Id. See generally Sindell v. Abbott Laboratories, 26 Cal. 3d 588, 607 P.2d 924, 163 Cal. Rptr. 132, cert. denied, 449 U.S. 912 (1980) (market share liability); Summers v. Tice, 33 Cal. 2d 80, 199 P.2d 1 (1948); Abel v. Eli Lilly & Co., 94 Mich. App. 59, 289
desire to ensure that an innocent, unsuspecting victim is not foreclosed from recovery by intractable, outdated common law evidentiary barriers. As a result of this judicial zeal to provide victim compensation, a system of alternative causation has evolved by which the courts have apparently subordinated the countervailing policy consideration that one should only suffer liability for those consequences that he or she has actually caused.

The relevant issue is whether any of these ameliorative causation devices should be injected into an administrative determination of a toxic tort claim. The answer should be a resounding "yes," provided the devices will substantially bridge the gap between legal causation and scientific causation and thus present a model truly apposite to intricate toxic tort causation problems. The proposed administrative compensation scheme will attempt to meld legal and scientific principles on the causation issue; more importantly, it will offer an adjudicative mechanism that will promote intelligent resolution of these issues. This will provide a partial break from the common law litigation model where scientifically uninformed judges and jurors attempt to decide esoteric causation issues in what may be described as a game of chance that actually undermines the rights of the parties to a fair and impartial adjudication of the issues.

To avoid unenlightened, opaque decision-making in the field of toxic torts, a capable arbiter is necessary to deal effectively with every complicated question; this principle is especially true of the causation issue. To this end, a


306. See supra notes 151-61 and accompanying text.


309. Note, Scientific Evidence and the Question of Judicial Capacity, 25 WM. & MARY L. REV. 675, 684 (1984). Juries may not be competent to handle disputes involving complex issues of scientific fact. Id. Moreover, although judges are in a better position to resolve complex disputes because they are generally better educated than the typical lay juror, "[a] trial judge's educational advantage does not indicate . . . that the judge necessarily possesses the technical skills necessary to fully comprehend complex scientific evidence." Id. at 685; see also Ethyl Corp. v. EPA, 541 F.2d 1, 67 (D.C. Cir.) (concern about the incompetence of lay judges in complex litigation), cert. denied, 426 U.S. 941 (1976); Jasanoff & Nelkin, Science, Technology and the Limits of Judicial Competence, 68 A.B.A. J. 1094 (1982) (incompetence of the courts in dealing with scientific and technological problems).

310. See Pierce, Institutional Aspects of Tort Reform, 73 CALIF. L. REV. 917 (1985). The commentator postulates that tort reform in general is needed and that reform is especially needed in toxic tort cases because of the difficulty of establishing causation. Specifically, ad-
panel of experts in the fields of law, science, and medicine should be commissioned to resolve, among other things, the question of whether there is sufficient evidence of the requisite causal relationship between exposure of the claimant to a toxic or hazardous substance and the ensuing injury for which the claimant seeks recovery. This panel will be designated as the National Board for the Investigation and Compensation of Toxic Exposure Injuries (the Board). It will consist of six members, two lawyers, two scientists, a medical doctor, and an economist. The rationale for placing an administrative agencies are best equipped to determine causation, especially in cases of toxic torts, because of their superior ability to assess liability on the basis of statistical probabilities, to appraise costs on the basis of market share, and to award damages when the causation probability is less than 50%, all of which courts are unlikely to do. Id. at 932; see also Huber, supra note 302, at 79 (courts should defer to experts in regulatory agencies). Courts may use expert special masters in complex environmental litigation. See Little, Court-Appointed Special Masters in Complex Environmental Litigation: City of Quincy v. Metropolitan District Commission, 9 HARV. ENVTL. L. REV. 435-469 (1984); see also Whitney, The Case for Creating a Special Environmental Court System, 14 WM. & MARY L. REV. 473, 485-86 (1973) (acknowledges need for special competence and expertise on part of decisionmakers in environmental tort cases and suggests system of environmental courts). But see Leventhal, Environmental Decisionmaking and the Role of the Courts, 122 U. PA. L. REV. 509, 549-54 (1974) (role of scientific experts should be limited to advisors to courts).

An administrative compensation scheme, however, would use special expertise more efficiently than would courts, although admittedly the use of experts can ease some of the cumber- someness that is characteristic of the judiciary's existing treatment of environmental litigation. But see Bazelon, Coping With Technology Through the Legal Process, 62 CORNELL L. REV. 817, 828 (1977) (cautions that scientific advisors may supplant judges). In Judge Bazelon's view the use of scientific advisors runs the risk of creating surrogate judges, who would be making all the real decisions, while ... judges are simply left to wear the black robes. In highly controversial areas, where the experts disagree, it would be dangerous indeed to allow one expert with one point of view to have special access to the judge's ear.

Id. This apprehension may have prompted some courts to refrain from hearing cases that involve complex and technical issues beyond their competency. See Washington v. General Motors Corp., 406 U.S. 109, 113 (1972); Ohio v. Wyandotte Chems. Corp., 401 U.S. 493, 503-04 (1971). Although the concern that expert advisors will somehow preempt judges may have some merit, in the proposed administrative compensation scheme each member of the expert panel that will make the critical decisions will possess specialized knowledge, and the likelihood of an uninformed arbiter being neutralized by some highly skilled expert is perhaps nil.

311. See the proposed Product Liability Voluntary Claims and Uniform Standards Act 25 (Staff Working Draft #1, July 15, 1985) [hereinafter cited as Staff Working Draft #1] (establishes Health Effects Panel).

This bill was ultimately reported out of the Senate Committee on Commerce, Science, and Transportation on August 15, 1986, as The Product Liability Reform Act (S. 2760). Senate Leader Robert Dole withdrew S. 2760 from further consideration, explaining that the measure could not pass that year with so little time left in the session. See Senate Kills Products Liability, THE WEEK IN CONGRESS, CONG. INDEX (CCH) 2 (Sept. 26, 1986).

312. The proposed composition of the Board mirrors the integral perspectives in a toxic tort determination. Thus, the confluence of well-informed individuals in the areas of law, science, medicine, and economics will markedly enhance the likelihood of reaching a sound policy decision. Staff Working Draft #1, supra note 311, at 34, on the other hand, charges a Health Effects Panel with determining causation. Nine members, each of whom is well-qualified and specifically trained in medicine or science, will compose the Health Effects Panel. The proposed act also designates the method of selection, staffing, compensation, and administrative support of the panel. In the administrative compensation scheme proposed here, the Secretary of Commerce will appoint the members of the Board pursuant to a federal statutory mandate that they be exceptionally well-qualified to assess the scientific, medical, legal, and economic issues attendant to the causation question in toxic or hazardous exposure cases. Consistent with the indispensable requirement that members of the Board be fair and impar-
mist, a nonscientist, on the Board is to ensure that the economic ramifications of a cause-in-fact determination are always available to the Board. This arrangement is consistent with the notion that economic considerations are generally at the heart of environmental decision-making. To be sure, profound political and economic factors underlie the toxic tort causation conundrum.

Despite the presence of an economist, legal, medical, and scientific perspectives will primarily guide the Board. Consequently, the test for causation that currently predominates the law, that causation must be established on a more probable than not basis, will be tempered by scientific and medical notions that just as easily can state causation in terms of scientific probability. Rarely, if ever, can a scientist or medical doctor be absolutely certain; thus, the Board should realize that, in the area of toxic tort litigation, the causation question is such that a mere scientific probability, not a greater probability, should be the touchstone for recovery.

To ensure the orderly administration of the Board the Secretary of Commerce should appoint an administrator, with impeccable administrative abilities, to handle ministerial duties such as the filing, docketing, and monitoring of administrative claims and perhaps to head up the investigation arm of the Board. See Soble, supra note 192, at 753 (commentator delineates a rough counterpart labelled an "Ombudsman").


314. See Soble, supra note 192, at 685.

315. See Note, supra note 282, at 516-21. Scientists calculate the likelihood of injury from exposure to a toxic substance by measuring the severity of exposure, which is measured by the proximity of the waste or by the degree of direct contact with the waste. These scientific findings are expressed in terms of probability. Moreover, scientists infer causation from statistical correlations between proximity to hazardous waste and higher rates of disease, illness, or birth defects. Id.; see also Note, Judicial Attitudes Towards Legal and Scientific Proof of Cancer Causation, 3 COLUM. J. ENVTL. L. 344 (1977) (exhorts courts to be more sensitive to probability in assessing legal liability for causation of cancer).

316. Comment, supra note 273, at 249. The commentator states:

Courts should require less than the traditional quantum of proof from the plaintiff in toxic tort cases. Provided the plaintiff proves the unavailability of other medical evidence, the court should permit the case to go to trial with statistical evidence limited to the issue of causation and the issue of causation limited to the probability alleged in the complaint. Upon sufficient evidence, the plaintiff should be awarded a recovery proportional to the probability of causation he has shown.

Id.; see also Rosenberg, supra note 6, at 866 (advances proportionality theory that allows recovery regardless of probability of causation or absence of individualized proof of causation).
Board’s ready acceptance of epidemiological proof, toxicological studies, animal studies, and other scientifically sanctioned evidence to illumine the causal nexus issue thus is necessary. By no means should the Board’s acceptance of scientific data emasculate the requirement of adequate proof of causation. Adequate proof of causation remains the cornerstone of this administrative compensation proposal, but if the evidence, including scientific evidence, reaches the level of reasonable probability, the requisite causal relationship for awarding compensation should exist. Although this probability standard eases the claimant’s burden on the causation question, it does not completely relieve him or her of all responsibility. Moreover, the claimant will present his or her case under the watchful eye of an expert Board, the majority of whom will understand the complex issues underlying the causation determination. As a consequence, the claimant’s burden may actually be greater than under traditional common law principles because of the detached, objective manner in which the Board will likely approach the issue. This scenario is a far cry that the heartrending reaction that purportedly underlies the decisions of lay jurors in many complex tort cases. Moreover, having individuals on the Board who have the requisite legal, medical, and scientific backgrounds to resolve the causation issues accurately and expeditiously will tend to be economically efficient.

To ensure a reasonable degree of fairness, however, the six-member Board’s decision should be subject to appellate review. A three-member Toxic Exposure Compensation Commission should conduct the review, which will be limited in scope. A truncated appellate process ensures the speedy disposition of the matter and reduces the transaction costs associated with the prosecution and defense of toxic tort claims.

317. Aligning the causation element with scientific standards, while accepting scientific evidence to give the causation element substantive content, makes this proof apposite to the toxic tort causation issue.

318. The claimant must still meet a threshold level of proof, a reasonable probability, to prevail. Although the level of proof necessary, 50% or less, will vary with the facts, this is by no means an empty requirement.

319. In tort litigation, lay jurors’ verdicts are often very sympathetic toward the injured plaintiff. Because “damages are not determined by a concrete legislative schedule as under workers’ compensation, but are left to the jury to measure on a case-by-case basis under a general formula which gives the jury wide discretion and considerable opportunity to apply its own independent judgment” changing this phenomenon is unlikely. R. Epstein, C. Gregory & H. Kalven, Jr., supra note 201, at 742; see also Abraham & Merrill, supra note 249, at 104 (jurors may ignore legal instructions and make a decision based on sympathy).

320. A limited appellate process assures that claims will be resolved with alacrity. Thus, the Toxic Exposure Compensation Commission should hear appeals only if a federal, procedural due process, constitutional right is at risk. See Prince, supra note 298, at 728. The Toxic Exposure Compensation Commission should be made up of three administrative law judges because the Commission’s appellate jurisdiction is circumscribed to this narrow question of constitutional law.

321. Huber, supra note 302, at 77. The commentator notes: Furthermore, the new tort system does not serve as an effective tool for compensating victims of public risks. Rather, it is highly capricious, its proceedings are interminably protracted, and, worst of all, its agents are extremely expensive. For every dollar that—after many years—ends up in the pocket of an injured plaintiff, several dollars will be diverted to lawyers for the plaintiff and
b. Allowable Damages. Compelling policy questions surround the issue of what damages a successful claimant in a toxic tort case should receive. Should an administrative compensation scheme allow damage awards that mirror traditional tort remedies or should the permissible compensation package be streamlined and thus provide compensatory relief that falls short of a full tort recovery? Policy considerations argue in favor of a combination of both possibilities.

For example, the full array of traditional tort damages furthers the ever present tort law goal of providing adequate compensation to the innocent victim. Within this catalog of damages the most debatable components are damages for pain and suffering and for loss of future earning capacity. Depending on the facts of the case, these components can and often do make up a substantial part of a personal injury award. Yet, both awards require a certain amount of "crystal balling" by the jury since they are inherently speculative and conjectural. The positive advantage of providing an innocent party full recompense for his or her injuries, however, generally overshadows the potentially negative features of pain and suffering and lost earning capacity awards. On the other hand, an administrative compensation scheme perhaps should eschew damages for pain and suffering and loss of future earning capacity because they have historically been used to allow the injured party to pay attorneys' fees and still have adequate compensation left. Moreover, the impetus for such awards, especially for pain and suffering damages, is frequently the emotional states of mind of jurors. Thus, a legitimate administrative compensation scheme, the argument goes, should limit recovery to those damages that can be established with a fair degree of specificity, that are not too speculative or conjectural, and that are not susceptible to being a product, in whole or in part, of the passion of a jury.
When the issue of punitive damages is injected into the equation, the policy questions intensify. Punitive damages serve two primary policy objectives: to punish the culpable party and to deter others from engaging in similar conduct. Some statutory and administrative compensation schemes expressly preclude punitive damages. Other schemes do not specifically address the issue, so courts have addressed the question. Punitive damage awards that actually punish wrongdoers who act with conscious indifference for the safety of others and that deter others from engaging in similar conduct appear to further important policy objectives. Arguments against the imposition of such a sanction, however, do exist. The arguments include: (1) punishment as a basis for action should be restricted to criminal proceedings and not allowed in civil tort proceedings, and certainly not in civil administrative proceedings; and (2) punitive damages are simply a


328. See, e.g., W. Prosser, J. Wade & V. Schwartz, supra note 239, at 560. The authors note:

The policy of awarding punitive damages in tort cases has been a subject of much dispute. It has been condemned as undue compensation to the plaintiff beyond his just desserts, in the form of a criminal fine which should be paid to the state, if to anyone, and which is fixed by the caprice of the jury, without any standards, and without any of the usual safeguards thrown about criminal procedure, such as proof of guilt beyond a reasonable doubt, the privilege against self-incrimination, and even the rule against double jeopardy—since, except in
means to ensure the recovery of attorneys' fees under the American rule while still affording the claimant a full measure of recovery.329 Even if either one or both of the foregoing arguments are unfounded, the fact remains that courts impose punitive or exemplary damages on the basis of evidence that does not approach the beyond a reasonable doubt standard of the criminal law.330 Furthermore, in an administrative compensation system the additional complicating factor of who pays the punitive damage award from the available source of funds presents other knotty problems.331 Thus, punitive damages will not be available under the proposed scheme. For the proposed administrative compensation scheme to fulfill its policy objectives of compensation, deterrence, and corrective justice, the remedial provisions must be meticulously tailored with these goals in mind. Thus, the proposed administrative scheme will permit unlimited recovery with respect to medical expenses, both past and future, and lost wages, both past and future. The theory underlying this liberal treatment of these two cardinal elements of damages is simple: these damages lend themselves to a greater certainty of proof, and the vast majority of toxic tort victims are likely to suffer these losses.332

On the other hand, an unrestrained remedy for damages for past and fu-
ture pain and suffering and mental anguish, loss of future earning capacity from personal injury or wrongful death, and permanent injuries, all of which are within the realm of the somewhat uncertain and speculative, seems ill-advised. Thus, as to these components of damages, a restrictive schedule or cap should limit a claimant’s recovery. What should these constraints on recovery be? Should the Board dole out compensation to claimants in gradations up to some maximum ceiling?

The Board should not make these intricate determinations out of whole cloth. Rather, a legislatively mandated schedule of maximum benefits should control these types of damages. The Board should have discretion to determine damages falling below the maximum allowable amount, and should base these awards on the nature and degree of the claimant’s injury, the claimant’s occupational and educational background, and, in the case of wrongful death, the life expectancy of the deceased or surviving spouse or next of kin, whichever is less. In assessing these damages the Board will act essentially like a jury except that it will have maximum limits beyond which it cannot tread. This system will serve the interests of the claimant.

333. Such damages, if doled out without any limitations, could place undue pressure upon the financial integrity of the compensation fund. Of course, the elimination of the lay jury from the process reduces the likelihood of outlandish, deep-pocket claims against the fund. See Huber, supra note 302, at 81. Similarly, no recovery will be allowed for some of the novel damage claims currently made in toxic tort litigation: deprivation and denigration of the quality of life, lifetime medical surveillance, increased risk of future disease, and fear of future injury. Such damages are too speculative and would probably jeopardize the fiscal integrity of the compensation fund. For a discussion of these innovative damages see Ayers v. Township of Jackson, 189 N.J. Super. 561, 461 A.2d 184, 186-90 (Super. Ct. Law Div. 1983), aff’d in part, rev’d in part, 202 N.J. Super. 106, 493 A.2d 1314 (Super. Ct. App. Div.), cert. granted, 102 N.J. 306, 508 A.2d 191 (1985).


335. See O. Harris, Arkansas Wrongful Death Actions § 10-3 (1984) (citing Helena Gas Co. v. Rogers, 104 Ark. 59, 147 S.W. 473, 476 (1912); Fordyce v. McCants, 51 Ark. 509, 11 S.W. 694, 695-96 (1889)).

336. Necessity requires the imposition of maximum limits to recovery to maintain a reasonable level of benefits for injured claimants at affordable costs. Although the proposed administrative compensation scheme obviates the specter of heartrending jury awards,
by granting him the advantages of a deliberative process involving some measure of discretion; the system will also mollify the defendant polluters by shielding them from unreasonably large monetary awards based on nebulous and extremely speculative elements of damage.

In summary, the proposed compensation system will provide a reasonable level of compensation to the toxic tort exposure victim, limiting the recovery of only those damages that are inherently speculative and that defy exact measurement, while still providing a schedule of benefits that ensures more than just a token award for past and future pain and suffering, mental anguish, loss of future earning capacity, and permanent injury caused by the toxic exposure. Moreover, those damages that are readily reducible to a definite amount, lost wages and medical expenses, are not limited in any fashion. This mixture of limited and unlimited damage provisions will not only provide adequate compensation to the exposure victim, but will also bring about a favorable level of deterrence because of the specter of a sizable, though not unlimited, administrative recovery. Furthermore, the provisions designed to keep liability within reasonable bounds will foster justice and fairness for polluters by shielding them from possible catastrophic liability.

c. Method of Funding. To be a practicable alternative to the traditional tort liability system an administrative compensation scheme for toxic torts must receive funding in a manner that fosters solvency, encourages future research and development, and exacts contributions from polluters in an amount proportionate to the risk they create. To ensure solvency, eligibility criteria for funding the compensation program should embrace an extensive number of generators, transporters, and disposers of toxic substances and hazardous wastes. With this broad-based support of the compensation prophylactic measures aimed at fostering fiscal prudence in administering compensation funds remain vital.

337. In connection with the preeminence of future research and development in toxic tort policy-making see Abraham & Merrill, supra note 249, at 102. The commentators suggest that the ultimate allocation of the burden of proof can play a significant role in future research into ascertainable, but unknown, risks. "[T]he likelihood that uncertainty will be resolved may be powerfully influenced by the allocation of the burden of proof in tort claims. The party who loses when uncertainty cannot be resolved has the incentive to discover the information necessary to resolve uncertainty, whether concerning source or biological causation." Id.; see Soble, supra note 192, at 687.

338. At a bare minimum, all generators, transporters, and disposal facilities, which are subject to the strictures of RCRA, should have some contribution obligation. Beyond this, the funding sources should comprise chemical and chemical feedstock producers as well as segments of the general manufacturing industry. In the Senate's most recent proposed Superfund bill, for example, the taxing authority extends to the manufacturing industry. Superfund: Congress has dawdled too long over a hazardous-wastes bill. Cincinnati Enquirer, Nov. 18, 1985, at A-8, col. 1 (impose .08% tax on every step of manufacturing process on all manufacturers, regardless of whether they contributed to the waste problem). But see House Passes Superfund Reauthorization, THE WEEK IN CONGRESS, CONG. INDEX (CCH) (Dec. 13, 1985) (House of Representatives voted against broad-based manufacturers' excise tax). The House of Representatives and the administration seemed myopic in not expanding the funding base to the manufacturing sector. House and Senate conferees, however, subsequently "agreed on a five-year, $10 billion program of increased Superfund taxes, with a controversial manufacturers excise tax as the linchpin of the taxing scheme." Budget Bill Stalls Adjournment, THE
pool the likelihood of avoiding some of the funding crises that have plagued Superfund is evident. Quite frankly, Superfund’s dilemma stemmed partially from the small base of chemical manufacturers that were obligated to contribute to the compensation fund; these manufacturers represented only a small percentage of those entities that may have contributed directly or indirectly to hazardous waste sites and to the environmental exposure problems that ensued.339

Under the proposed administrative compensation scheme the funding mechanism will implicate all those subject to RCRA as generators, transporters, and disposers of hazardous wastes.340 In addition, all manufacturers of chemicals and chemical feedstocks will have to contribute to the compensation fund.341 Although the funding base will broaden, the funding calculus will promote two objectives central to the overall success of the administrative scheme: (1) continued research and development concerning the etiology of toxic-related injuries, and (2) heightened deterrence of actual and potential offenders. Both should, in turn, have the salutary effect of overall risk reduction.342

More precisely, the funding scheme will use a formula that exacts contributions in direct proportion to the gravity of the risk created. If the nature of the activity is such that the actual and foreseeable risk is extremely high, then that actor will contribute a correspondingly higher amount to the compensation pool. Conversely, the lower the risk involved, the smaller the actor’s proportionate contribution will be to the fund.343 From a policy perspective this contribution formula will encourage a polluter to engage in scientific research to ascertain the nature of the danger, the etiology of the risk, and the precise paths that a toxic or hazardous substance travels to reach the exposure victim. Investing assets to study and resolve unknown, but ascertainable risks should reduce the risks of exposure;344 consequently, a concomitant diminution in the amount that such a polluter must contribute to the compensation fund is only fair.345

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339. See Stephan, Cleaning Up Hazardous Waste: May Companies Be Twice Taxed?, PREVIEW U.S. SUP. CT. DECISIONS, Issue No. 5, Dec. 7, 1985, at 129 ("Superfund is smaller than was originally proposed ($1.6 billion rather than $4.1 billion) and involves a tax on a smaller class of taxpayers (less than 1,000 rather than 260,000).”).

340. Consistent with the amendatory provisions of § 7003, 42 U.S.C. § 6973 (1982), the federal imminent hazard action provision, past and present generators, transporters, and owners of or operators of disposal facilities should contribute to the funding scheme. See also id. § 6924(u) (further evidence of Congress’s intention to broaden the reach of RCRA to past hazardous waste activities).

341. Congress did expand funding sources for Superfund by including the general manufacturing interests. See supra note 34.

342. See Note, supra notes 2, at 862.

343. For a discussion of the sliding scale concept see supra notes 231-38 and accompanying text.

344. Soble, supra note 192, at 723 (society should focus its creative energies on abating the unknown, but ascertainable, risks to human health and the environment).

345. See id. at 753. "As an incentive to minimize risk, the levy on toxic substances classified in the lowest category will always be zero." Id. at 752.
tion formula should also have a deterrent effect on polluters, for human behavior normally strives to attain that level of conduct that will mitigate, not increase, one's liability exposure.\textsuperscript{346} Thus, favorable response to risk-reducing conduct on the part of polluters will further some compelling and essential policy objectives of the proposed administrative compensation scheme. Such a response will provide an incentive for industry to engage in a research and development program on the effects of human exposure to toxic substances and hazardous wastes and will provide a disincentive for industry to engage in callous disposal practices that create an unreasonable risk to human health and the environment.

Not only is developing an administrative compensation scheme that is an incentive for polluters to reduce the risk of injury to human health and the environment from toxic substance or hazardous waste exposure necessary, but ensuring that the costs of funding the system are ratably borne by both industry and the federal government in a fair and equitable manner is also vital.\textsuperscript{347} Consequently, the proposed compensation scheme must be configured to achieve this end. Central to the idea of a scheme jointly funded by the chemical and waste management industries along with the federal government is the realization that the principal contributors to the hazardous and toxic substances exposure problem as well as the primary beneficiaries of any risk-reduction effort should share equitably the financial burden of obviating or, at least, alleviating the risk.\textsuperscript{348} The polluter's obligation in this regard is transparent: if one creates the risk, one must shoulder some responsibility for eliminating or reducing it. The fairness of requiring the beneficiaries of a risk-reducing administrative compensation program, literally every man, woman, child, and living organism in our environment, to contribute to a compensation fund by paying taxes to the federal government is not so readily apparent. After all, this class did not create the risk; in fact,}

\textsuperscript{346} Though human behavior is often unpredictable, the proposed compensation scheme offers a solid analytical approach to deterrence, or risk reduction.


\textsuperscript{348} Cf. Futrell, The Environmental Law Institute Study: Statutory Reform of "Toxic Torts," in HAZARDOUS WASTES, SUPERFUND, AND TOXIC SUBSTANCES, ALI-ABA COURSE OF STUDY MATERIALS 225, 226 (1985) ("the ELI Study recommends establishment of a compensation scheme financed by a tax on oil and chemical feedstocks for the initial baseline of the fund. The Study also sets up a system for phasing in a hazard fee to replace eventually the feedstock tax as the source of money for the fund. . . . The fund should internalize the external costs of injuries.").
for the most part, its members are victims of it. So why should these people be saddled with any responsibility? Perhaps the answer is not too complex. We are all a part of the same "commons." If any threat to the existence of any part of the "commons" is diminished in any way and at any time, then each of us is to some degree a beneficiary. Consequently, we may, as a matter of fundamental fairness, have to provide some recompense. Moreover, both the chemical industry and the waste management sector provide products and services of high social utility in which we, the members of society, again principally benefit. Thus, it seems palpably fair and reasonable that the risk of loss should at least be partially spread throughout society by general tax levies as opposed to letting the risk fall solely on the shoulders of chemical producers and hazardous and toxic waste generators, transporters, and disposers.

V. Conclusion

Proving causation is a key ingredient to the successful prosecution of a toxic tort action for compensation of an exposure victim. Unfortunately, since the typical toxic tort case involves complex questions of law, science, medicine, economics, and public or social policy, no simple solution exists for ameliorating the harsh impact that onerous evidentiary requirements place on an injured claimant. One thing, however, is reasonably apparent:

349. Hardin, supra note 247, at 1248.
350. Id. According to the commentator, if a threat to the "commons" goes unchecked, the ineluctable consequence will be utter tragedy and destruction. Conversely, if coercive measures, such as taxes, are imposed, then unbridled "freedom" to the "commons" is abridged, averting the tragedy. Ironically, the imposition of this additional tax burden, or any other coercive device, upon the public can be the salvation of the "commons." Id. Everyone benefits, therefore, by ensuring that "the environment will never again be a 'free good.'" Kean, The Environmental Movement in 1985: Between NEPA and 2000, 10 COLUM. J. ENVTL. L. 199, 209 (1985).
351. Some notable examples of highly beneficial, yet conceded risky, products emanating from the chemical industry are PCBs, which have very good electrical resistance capacity, making them useful components of electrical transformers, methyl isocyanate, which is useful in making pesticides, and dioxin, a waste product of a beneficial herbicide manufacturing process. The waste management sector is essential to society. To understand the importance of waste management, one only needs to ask what would life be like for us if we had no place to store or dispose of our solid or hazardous waste? Life would probably be chaotic and surely would be unhealthy.
352. Under some facts, as a matter of sound public policy, taxpayers of a governmental entity should ratably bear losses instead of requiring a small group of individuals to bear the losses alone. See Petition of Kinsman Transit Co., 338 F.2d 708, 726-27 (2d Cir. 1964) (in a tort case taxpayers of Buffalo, New York, rather than innocent plaintiffs could bear ratable losses more easily).
353. The recently experienced inadequacy and nonavailability of a taxing authority for Superfund is a classic illustration of the desirability of a funding apparatus that ensures the continued financial solvency of a victim compensation scheme.
the common law tort system's causation model is ill-equipped to address the intricate nuances underlying the causation issue in toxic tort litigation. Although tinkering with causation by palliative devices such as alternative causation, enterprise liability, and concert of action offers some relief to a disadvantaged claimant, this tinkering falls far short of the mark in providing compensation to the victim, in deterring the polluter and others similarly situated, and in advancing corrective justice and fairness between the parties. Moreover, this deficiency is exacerbated by the apparent inability of judges and juries to handle capably the esoteric scientific and medical questions that abound regarding the issue of the causal relationship between a claimant's injury and his or her exposure to a toxic substance or hazardous waste. In view of these major hurdles, reconciling the causation element of traditional common law torts with the toxic tort counterpart seems well-nigh impossible and, more importantly, very impractical.

Since the traditional tort litigation model seems inappropriate for addressing causation, a proposed alternative solution suggested in this Article eschews the traditional model's deficiencies and presents itself in the form of an administrative compensation scheme. The objective of this system is not to dispense with a causation requirement; to the contrary, policy considerations underlying the proposed scheme mandate that the requisite causal nexus exist. Existing legal notions of the dominant test for this causal requirement, the more probable than not test, however, will not necessarily control; in fact, greater deference will be given to scientific and medical theories regarding the requisite proof of causation as science and law meld together to resolve this intricate question. In addition, the administrative scheme's use of an expert administrative board to decide the causation question will obviate the likelihood of uninformed decision-making. The advantages attendant to using this administrative procedure are: (1) it will produce a multidimensional determination of liability, thereby accurately reflecting the nature of the problem involved, and (2) it will remove this determination from the whim and caprice of unsophisticated, uninformed judges and lay jurors, thus enhancing the likelihood of a reasonably accurate determination. As a result, the proposed compensation scheme will promote a more objective, fair, and precise causation determination. Coupled with the other features of the scheme concerning damages and methods of funding, the proposed administrative compensation scheme will further the principal tort law goals of compensation, deterrence, and corrective justice. Most significantly, however, the proposed administrative compensation scheme will reconcile the causation element and toxic tort litigation, a truly notable feat.

354. The elimination of nonmeritorious toxic tort claims further the tort goals of fair compensation, effective deterrence, and corrective justice. Even an administrative scheme, that shuns lay jurors, needs prophylactic measures to guard vigilantly against nonmeritorious claims. The preeminent protection against frivolous claims is a causation requirement. See Huber, supra note 302, at 81. "[A] claimant for funds must be required to show causation, if not beyond a reasonable doubt then at least with some serious degree of scientific credibility. An administrative compensation system should be able to enforce this requirement at least as effectively as a court." Id.