MEDICAL CAUSATION IN TOXIC TORT CASES

Expert scientific evidence makes or breaks most toxic tort cases. Expert testimony provides the critical link to proximate cause, consisting of cause-in-fact and legal cause. The experts are usually epidemiologists, toxicologists or treating doctors. The cascade of new medical technology and methodology tests undermine the limits of traditional standards of proof. Such new methodologies may introduce evidence that may be suspect, but impossible to refute due to lack of data. Too often “expert" witnesses are hired "not for their scientific expertise, but for their willingness to testify, for a price, to say whatever is needed to make the client’s case". As the litigation explosion expands ... “junk science is producing junk law.” Thornburgh, *Junk Science –The Lawyer’s Ethical Responsibilities, 25* Fordham URB. L. J. 449 (1998). To what extent should the trial court examine the methodological basis of expert scientific testimony?

A. The Legal Tests for Admission of Scientific Evidence

It is black letter law that the proponent of the evidence must establish its reliability. This concept is the basis for all rules for admissibility of scientific evidence. The proponent must demonstrate both that the theory upon which the scientific evidence is based and the technique applying the theory are valid and that the theory and the technique were properly applied in the particular case. Maryland and Federal Courts have arrived at different

answers. Maryland Courts apply the *Frye/Reed test* first enunciated *in Frye v. U.S.,* 293 F. 1013 (D.C. Cir.1923) and adopted in Maryland in *Reed v State*, 283 Md. 374, 380-381, 391 A. 2d 364, 368 (1978). This test applies to "novel" scientific tests and the expert opinions that necessarily rely upon those tests. Expert opinion that relies upon established scientific theories but "is not presented as a scientific test the results of which are controlled by inexorable, physical laws" must be rendered to a reasonable degree of probability in the particular field. *Myers v Celotex,* 88 Md. App. 442, 458, 594 A. 2d 1248, 1256-1257 (1991) (citing State v. Allewalt, 308 Md. 89, 98, 517 A.2d 741 (1986). The Federal Courts apply the *Daubert test* first enunciated in *Daubert v. Merrell-Dow Pharm., Inc., 509 U.S. 579 (1993)*.

1. Maryland Law

a. The Maryland Rules of Evidence:

Maryland Rule of Evidence 5-702

> Expert testimony may be admitted, in the form of an opinion or otherwise, if the court determines that the testimony will assist the trier of fact to understand the evidence or to determine a fact in issue. In making that determination, the court shall determine (1) whether the witness is qualified as an expert by knowledge, skill, experience, training, or education (2) the appropriateness of the expert testimony on the particular subject, and (3) whether a sufficient factual basis exists to support the expert testimony.

Maryland Rule of Evidence 5-703

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

Maryland Rule of Evidence 5-403

Exclusion of Relevant Evidence on Grounds of Prejudice, Confusion, or Waste of Time
Although relevant, evidence may be excluded if its probative value is substantially outweighed by the danger of unfair prejudice, confusion of the issues, or misleading the jury, or by considerations of undue delay, waste of time, or needless presentation of cumulative evidence.

b. *The Reed/Frye Test*

Prior to the enactment of these rules, *Frye v U.S.,* 293 F. 1013 (D.C. Cir.1923) set the standard for determining the reliability of scientific proof in Maryland and nationally. The Frye test was adopted in Maryland in *Reed v State*, 283 Md. 374, 380-381, 391 A. 2d 364, 368 (1978) and is known as the Frye/Reed test. The Committee note to Rule 5-702 specifies that "[t]his Rule is not intended to overrule *Reed v State, 283 Md. 374 (1978)* and other cases adopting the principles enunciated in *Frye v U.S..."* In *Frye,* the trial court rejected the admissibility of an early polygraph test offered to prove the truthfulness of the defendant in a criminal case. On appeal, the court held that before a scientific opinion will be received at trial, the basis

of that opinion must be generally accepted within the expert's scientific field. The court reasoned:

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

Frye, 293 F. at 1014

Frye contemplates a two-stage process for "novel" science. First, the scientific community develops a theory and determines the reliability of a scientific method through research, experimentations and publication. Second, once the novel science becomes generally accepted, it may be used as evidence in the courtroom. The proponent of the evidence may demonstrate "general acceptance" through surveys of scientific publications, judicial decisions, practical application or testimony by scientists of its general acceptance. Strong, *McCormick On Evidence,* at §203 (5th Ed. 1999). In *Keirsey v. State*, 106 Md. App. 551, 558, 665 A. 2d 700, 703 (1995), rev'd on other grounds, 342 Md. 120, 674 A. 2d 510 (1996), the court listed three parts to the test:

> The proponent of scientific evidence can satisfy the Frye-Reed test in three ways: (1) proving to the trial judge, through testimony and exhibits (including persuasive authority from other jurisdictions), that the relevant

> scientific community is in agreement that the technique at issue produces an accurate result; (2) asking the trial judge to take judicial notice of a reported opinion in which a Maryland appellate court has held that the technique at issue satisfies the Frye-Reed test; or (3) asking the trial judge to take judicial notice of a statute in the Annotated Code of Maryland that provides for the admissibility of the test results at issue.

The Frye/Reed test applies solely to "novel" scientific tests and opinions which necessarily rely on those tests.

> Maryland case law distinguishes the opinion that cannot be expressed without reliance upon an unaccepted scientific theory from the opinion that interprets reliance upon an unaccepted scientific theory from the opinion that interprets scientifically acceptable data in a different way. It's one thing to exclude a physician's opinion based upon a thermography test. It's an entirely different issue when the physician's opinion is based upon an interpretation of epidemiological studies and/or x-rays that other physicians have read differently. In this situation the trial judge must initially determine whether he is persuaded that the expert's basis is reliable. Appellate review of this determination will not determine whether there was an abuse of discretion or whether it was clearly erroneous. The appellate court review whether this finding "is against the weight of the evidence." Gobey, 73 Md. App at 239, 533 A. 2d at 947.

Murphy, Maryland Evidence Handbook §1406(B) (Michie 1999). *See Owens Corning v Bauman*, 125 Md. 454, 498, 726 A. 2d 745, 767 (1999). In *Myers v Celotex*, 88 Md. App. 442, 456-460, 594 A. 1248, 155-57 (1991), the Court said that expert opinion that relies upon established scientific theories but "is not presented as a

scientific test the results of which are controlled by inexorable, physical laws" must be rendered to a reasonable degree of probability in the particular field. There the court reasoned:

> The standard for the admissibility of medical expert opinion testimony is reasonable medical probability [citations omitted] The "generally accepted in the medical community" standard that was erroneously employed by the court in the case sub judice was adopted in Maryland in Reed v State, 283 Md. 374, 391 A. 2d 364 (1978), and generally applies to the admissibility of evidence based upon novel scientific techniques or methodologies. [citation omitted]. In that respect, it is perfectly logical and reasonable to insist that prior to the introduction of expert testimony on the validity of new scientific technique (i.e., lie detector tests, breathalyzer tests, paraffin test), it must first be established that the scientific technique has been generally accepted by the relevant scientific community as reliable.
>
> That exposure to asbestos may cause cancer, however, is not a novel or controversial assertion, nor is it a conclusion personal to Dr. Schepers. The testimony that appellants sought to introduce was Dr. Schepers's opinion as to how asbestos causes cancer. Such testimony was based upon Dr. Schepers's personal observations and professional experience, and thus required only a reasonable degree of medical probability. [citations omitted]. The holding in Reed v State, supra, has not been extended to medical opinion evidence which is not "presented as a scientific test the results of which were controlled by inexorable physical laws." [citation omitted]. We do not believe it was properly applied to Dr. Schepers's medical opinion evidence in this case.

Id. at 458-459.

Instead, the proper rule is whether Dr. Schepers held his opinions within a reasonable degree of medical probability. *Id.* at 458.

The Frye opinion dealt with an early polygraph test, but nothing in the opinion limits the use of the "general acceptance" standard to scientific testing. On the contrary, the court's opinion specifically used the phrase "scientific principle, or discovery," suggesting that any "scientific principle" should be subject to testing for general acceptance in the relevant field.

This dovetails with the general trend of rejecting or limiting the Frye/Reed test. Professor Strong in *McCormick On Evidence* opines:

> General scientific acceptance is a proper condition for taking judicial notice of scientific facts, but is not suitable as a determinant of the admissibility of scientific evidence. Any relevant conclusions supported by a qualified expert witness should be received unless there are distinct reasons for exclusion. These reasons are the familiar ones of prejudicing or misleading the jury or consuming undue amount of time.

John Strong, McCormick on Evidence, 733-734 (1999).

C. *Reasonable Degree Of Medical Certainty*

What is a "reasonable degree of medical certainty/probability?" It is generally thought of as a "more likely than not" standard. S*ee, e.g., Pierce v Johns-Manville Sales Corp.,* 296 Md. 656, 666, 464 A. 2d 1020, 1026 (1983); *Davidson v. Miller*, 276 Md. 54, 62, 344 A.2d 422, 427-28 (1975); *cf. Murphy, supra,* §1404-1405; *see generally,* Lewin, *The Genesis and Evolution of legal Uncertainty About Reasonable Medical Certainty*, 57 Md. L. Rev. 380, 400-401 (1998):

> The universal use of the phrase "reasonable medical certainty," and the importance that some courts attach to this phrase, cannot be explained by its intrinsic meaning, for the phrase has no readily apparent meaning. The very notion of "reasonable certainty" is almost an oxymoron, because the adjective "reasonable" qualifies and essentially negates the absolute implications of the noun "certainty." Insertion of the adjective "medical" does not reduce the tension between "reasonable" and "certainty," for the concept of certainty is just as elusive in medicine as in other scientific disciplines and perhaps more so.

"Medical certainty" is not a medical term. *Id.* at 402 *See, also, Marder v G.D. Searle & Co*., 630 F. Supp. 1087, 1093 (D. Md. 1986); *Pease v. American Cyanamid Co., 795 F. Supp. 755 (*D. Md*. 1992)* (expert testimony that vaccine possibly caused neurological damage was insufficient). *See, e.g., Sterling v Velsicol Chem. Corp*., 855 F. 2d 1188, 1201 (6th Cir. 1988) ("Medical testimony that ingesting the contaminated water 'possibly,' 'may have,' 'might have,' or 'could have' caused the plaintiffs' presently ascertainable or anticipated injuries does not constitute the same level of proof as a conclusion by a reasonable medical certainty.").

d. *New Applications for "Generally Accepted Tests"*

Sometimes an established technique that has gained acceptance (and met the Frye standard) for the purpose for which the technique was designed is applied for another purpose, one different from its designated purpose. In that case, the new purpose must be subject to

the Frye/Reed analysis. *Keene Corp. v Hall*, 96 Md. App. 644, 659-660, 626 A. 2d 997, 1005 (1993) (Diane Motz).

2. Federal Law

a. Federal Rules of Evidence

Federal Rule of Evidence 702:

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

Federal Rule of Evidence 703:

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

Federal Rule of Evidence 403

> Although relevant, evidence may be excluded if its probative value is substantially outweighed by the danger of unfair prejudice, confusion of the issues, or misleading the jury, or by considerations of undue delay, waste of time, or needless presentation of cumulative evidence.

b. The Daubert Standard

In 1993, the U.S. Supreme Court*, in Daubert v. Merrell-Dow Pharm., Inc.,* 509 U.S. 579 (1993), changed the standard governing the admissibility of expert testimony in presenting scientific evidence. The opinion begins by construing Rule 702. The Court stated that the words "scientific" and

"knowledge" "connote[s] more than subjective belief or unsupported speculation pursuant to Rule 702." *Id.* at 590. Reading those terms together, the Court found that the Rule limits scientific expert testimony to opinions that are the product of scientific thinking. The Court reasoned:

> [I]n order to qualify as "scientific knowledge," an inference or assertion must be derived by the scientific method. Proposed testimony must be supported by appropriate validation-i.e., "good grounds," based on what is known. In short, the requirement that an expert's testimony pertain to "scientific knowledge" establishes a standard of evidentiary reliability.

Id. at 590.

The Court must conduct "a preliminary assessment of whether the reasoning or methodology underlying the testimony is scientifically valid and of whether the reasoning or methodology properly can be applied to the facts in issue." Id. at 592-593. The Court provided a non-exclusive list of factors the trial court should consider in this gate-keeper function.

1. Whether the theory or technique used by the expert can be, and has been, tested;
2. Whether the theory or technique has been subjected to peer review and publication;
3. The known or potential rate of error of the method used; and
4. The degree of the method's or conclusion's acceptance within the relevant scientific community.

Id. at 593-594

The trial court must also decide whether the experts' testimony fits the facts of the case; that is, is it relevant? Rule 702's requirement that the testimony "assist the trier of fact" mandates that

the testimony is sufficiently tied to the facts of the case. Fed. R. Evid. 702.

The Court noted that Rule 703 requires that the expert's opinion must be based upon type of facts and data that are "reasonably relied upon by experts in the particular field in forming opinions or inferences upon the subject." *Id. at 595 citing Fed R. Evid.* 703.

"Abuse of discretion" is the appellate standard of review in assessing a trial judge's screening of scientific evidence. *General Electric Co. v. Joiner*, 118 S.Ct. 512, 517 (1997). *Daubert's* scope created controversy in the lower courts over whether it just applies to "scientific" expert testimony or whether it also applies to medical opinion testimony.

1. *Fourth Circuit and District Court Cases Applying Daubert*

In a widely cited decision, *Cavallo v Star Enters.,* 892 F. Supp. 756 (E.D. Va. 1995), *aff'd in part and rev'd in part, remanded,* 100 F. 3d 1150 (4th Cir. 1996), the trial court granted summary judgment after excluding the plaintiff's causation expert toxicologist and immunologist on motion in limine. There, the plaintiff claimed that a brief exposure to jet aviation fuel she suffered a RADs-type illness. *See* Id. at 759. The court rejected the expert testimony because neither expert followed established toxicological methodology in

forming their conclusions. *See* Id. at 773. Instead, they tried to extrapolate from studies of different volatile organic compounds. *See* Id. at 769-770.

In *Benedi v McNeil P.P.C. Inc.,* 66 F. 3d 1378 (4th Cir. 1995), the court upheld an $8.2 million dollar award for liver failure due to the interaction between Tylenol and alcohol. The court held that "epidemiological studies are not necessarily required to prove causation, as long as the methodology employed by the expert in reaching his or her conclusion is sound." *Id.* at 1384.

Ballinger v. Atkins, 947 F. Supp. 925 (E.D. Va 1996) (biochemist not qualified to testify that NutraSweet caused neurological damage); *Goewey v United States,* 886 F. Supp 1268 (D.S.C.1995), *aff'd,* 106 F.3d 390 (4TH Cir. 1997) (expert's testimony not sufficiently reliable in case involving alleged neurotoxic insult to child); *Westberry v. Gislaved Gummi AB*, 178 F.3d 257 (4th Cir. 1999); *Cooper v. Laboratory Corp. of America Holdings, Inc*., 150 F.3d 376 (4th Cir.1998); *Ruffin v. Shaw Industries, Inc.,* 149 F.3d 294 (4th Cir. 1998).

1. *The Expert's Specialized Knowledge*.

Neuropsychologists may testify regarding neurologic defects, but not causation. *Goewey v United States,* 886 F. Supp 1268,1281-82 (D.S.C.1995), *aff'd,* 106 F.3d 390 (4th Cir.1997); *Sanderson v International*

Flavors and Fragrances, Inc. 950 F. Supp 981, 1001 (C.D.Cal 1996); *Summers v Potts,* 897 F. Supp. 533, 540 (E.D.Okla. 1995) (psychologist's opinion on causation in multiple chemical sensitivity case excluded because she was not a doctor or toxicologist); *Louderback v Orkin,* 26 F. Supp 1298, 1302 (D.Ka 1998).

c. Scientific v. Nonscientific Experts

Many courts, limiting *Daubert* to its scientific facts, held it did not apply to the testimony of treating physicians. *See Zuchowicz v. United States,* 140 F.3d 381 (2d Cir. 1998) (Pulmonary expert regarding Danocrine); *Compton v Subaru of America*, 82 F. 3d 1513-1518-1519 (10th Cir. 1996) ("application of the *Daubert* factors is unwarranted in cases where expert testimony is based solely upon experience or training.... In such cases, Rule 702 merely requires the trial court to make a preliminary finding that the proffered expert testimony is both relevant and reliable while taking into account the inquiry envisioned by Rule 702 is... a flexible one); *Poust v Huntleigh Healthcare,* 998 F. Supp. 478 (D. N.J. 1998) (treating physician and law/expert regarding pneumatic compression device). Other courts have applied *Daubert* to medical opinion testimony. *Moore v Ashland Chemical Inc.* 151 F. 3d 269 (5th Cir. 1998) (RADs).

1. *Kumho Tire Co.*

In March 1999, the Supreme Court held in *Kumho Tire Co. v Carmichael,* 119 S. Ct. 1167 (1999), that *Daubert's* general qualification and reliability apply to "nonscientific" expert testimony, not just scientific testimony. In *Kumho Tire,* the plaintiffs claimed that a manufacturing defect caused a tire to blow out, which, in turn, resulted in numerous injuries and one death. *See* Id. at 1171. Plaintiffs' expert, who had a masters degree in mechanical engineering and 10 years work experience at Michelin America, Inc., as well as prior consulting experience in other tire blowout cases, gave his opinion that a manufacturing defect or design defect caused the plaintiffs' injuries. *See* Id. at 1172. He based his opinion upon the combination of his knowledge of tire failures, a personal four factor theory of the cause of tire failures, and his inspection of the tire at issue. *See* Id. at 1172-1173.

The trial court found that the expert's methodology was subjective, it had not been peer reviewed and there was no indication of the rate of error and there was no general acceptance of the four factor test for determining alternative causation. *See* Id. at 1173. The court granted summary judgment in favor of the defendants when it found that the testimony of the plaintiffs' tire failure expert did not meet the Daubert criteria. *See* Id. at 1173. The Eleventh Circuit reversed the trial court reasoning that Daubert applied to "scientific expert testimony" and not to nonscientific expert testimony. *See* Id.

at 1173. The Supreme Court reasoned that the Daubert factors (objective standards, peer review, rate of error, general acceptance) could all be applied to nonscientific expert testimony, but that the factors the trial court relies upon should depend upon the area of expertise that is being evaluated. The trial court's decision on the factors to be employed is reviewable only for abuse of discretion.

This decision rejects the reasoning of cases such as *Zuchowicz v. United States,* 140 F. 3d 381 (2d Cir. 1998); *Compton v Subaru of America*, 82 F. 3d 1513 (10th Cir. 1996); and *Poust v Huntleigh Healthcare,* 998 F. Supp. 478 (D. N.J. 1998).

The *Daubert/Kumho* Tire test differs from the Maryland rule. The Maryland Courts appear less inclined to examine the methodology of the testifying experts and to leave the test to cross-examination. This may have some basis in the rules. Maryland Rule 5-702 and Federal Rule of Evidence 702 are similar, but the Maryland Rule leaves open the proper standard for admitting scientific evidence. Kevin M. Carroll, *The New Maryland Rules of Evidence: Survey, Analysis and Critique*, 54 MD. L. Rev. 1085,1087 (1995). I note that *Keene v Hall,* 96 Md. App. 644 (1993), was decided by the Court of Special Appeals three days after Daubert.

B. Proximate Cause

> *"Obviously, the legal test includes a requirement that the wrongful conduct must be cause in fact of the harm; but*

> *if this stood alone the scope of liability would be vast indeed, for 'the causes of causes are infinite'…'The fatal trespass done by Eve caused all our woe*.'

James and Perry, *Legal Cause*, 60 Yale L.J. 761 (1951).

1. The tests for *Cause-in-fact.*

It is axiomatic that "proximate cause" consists of two elements: (1) cause-in-fact and (2) legally cognizable cause." *See, e.g., May v. Giant Food, Inc*., 122 Md. App. 364, 383, 712 A.2d 166, (1998) cert. denied, 351 Md. 286, 718 A.2d 234 (1998). "Causation in fact" is concerned with whether the defendant's conduct produced the plaintiff's injury? *Peterson v. Underwood,* 258 Md. 9, 16-17, 264 A.2d 851, 855 (1970). Maryland courts have employed two tests to determine whether cause-in-fact exists: the "but for" test, which is the general rule, and the "substantial factor test." *Yonce v. SmithKline Beecham Clinical Laboratories, Inc.,* 111 Md. App. 124, 138, 680 A.2d 569, 575 (1996), *cert. denied*, 344 Md. 118, 685 A.2d 452 (1996). Prosser and Keeton define the "but for" test as:

> The Defendant's conduct is a cause of an event if the event would not have occurred but for that conduct; conversely, the Defendant's conduct is not a cause of the event if the event would have occurred without it.

W. Page Keeton, et al., Prosser and Keeton on the Law of Torts; 41 at 266 (5th ed. & Supp. 1998).

The "substantial factor" test is defined as:

> The Defendant's conduct is a cause of the event if it was a material element and a substantial factor in bringing it about.

Id. at 267.

The substantial factor test should only be applied in limited situations. In *Yonce*, the court explained:

> By its very nature, the "but for" test applies when the injury would not have occurred in the absence of the defendant's negligent act. The "but for" test does not resolve situations in which two independent causes concur to bring about an injury, and either cause, standing alone, would have wrought the identical harm. The "substantial factor" test was created to meet this need but has been used frequently in other situations. Id. (citations omitted).

Yonce, 111 Md. App. at 138. *See, generally, Keeton and Prosser, supra,* at 267. In *Yonce,* the court considered three factors in applying the "substantial factor" test:

(a) the number of other factors which contribute in producing the harm and the extent of the effect which they have in producing it;

(b) whether the actor's conduct has created a force or series of forces which are in continuous and active operation up to the time of the harm or has created a situation harmless unless acted upon by other forces for which the actor is not responsible;

(c) lapse of time.

Yonce, 111 Md. App. at 138-39.

The substantial factor test is frequently applied in toxic tort cases. *See, e.g., Eagle-Picher Indust. v. Balbos,* 326 Md 179, 208-217, 604 A. 2d

445 (1992); *Owens-Illinois, Inc. v Armstrong,* 326 Md. 107, 119, 604 A.2d 47 (1992); *see, generally,* Bell, *Maryland Civil Jury Instructions and Commentary* §39.04 and Restatement (Second) of Torts, §431. The test is fact specific to each plaintiff's case and requires an understanding of the use of the product in the workplace and the plaintiff's activities in the workplace. *Eagle-Picher Indust.* 604 A. 2d at 460.

The "substantial factor" test differs from the "but-for" test, which tests whether the plaintiff would not have been injured but-for the exposure. *See, generally, Conde v Velsicol Chem. Corp.,* 804 F. Supp. 972 (S.D. Ohio 1992), *aff'd* 24 F. 3d 809 (6th Cir. 1994); *Vuocolo v Diamond Shamrock Chem. Co*., 573 A. 2d 196 (N.J. Super. Ct App. Div. 1990); *In re Agent Orange Prod Liab. Litig.,* 611 F. Supp. 1223 (E.D.N.Y. 1985), *aff'd on other grounds,* 818 F. 2d 187 (2d Cir. 1987). Under the "substantial factor" rule the issue is whether the exposure was a substantial or insignificant factor in plaintiff's injury. Restatement (Second) of Torts §431. Under the but-for rule, the issue is whether the exposure was a proximate or remote cause. 57A Am. Jur. *Negligence* §471, (1989).

The "substantial factor" test was originally formulated to clarify proximate cause analysis. W. Page Keeton, et al., *Prosser and Keeton On the Law of Torts,* §§ 41-42 at 278 (5th ed. & Supp 1988). Prosser and Keeton criticize the application of the "substantial factor" test:

> Using the "substantial factor" in this way as a substitute for satisfying a "but for" requirement seems likely to create confusion. This usage blends the substantive requirement ("but for" or a substitute for "but for" causation) with the requirement of proof ("preponderance of the evidence" or a substitute for that standard of proof). Such a blending seems likely to distract from a clear focus upon the disputed policy issues upon which each of these judicial choices is based –one about the substantive rule and the other about the burden of proof.

Id. at 43-44.

2. Proof of *Cause-in-fact*

Causation is the heart of any toxic tort case. Plaintiff must prove that:

- The plaintiff was exposed;
- To a particular chemical;
- The plaintiff suffered injuries;
- Compatible with those that the chemical may produce.

a. Proof of Exposure

Exposure may be proven by circumstantial evidence. In *Eagle-Picher Indust.,* 604 A. 2d at 460, the plaintiffs did not work directly with asbestos products. The court reasoned that:

> Whether the exposure of any given bystander to any particular supplier's product will be legally sufficient to permit a finding of substantial-factor causation is fact specific to each case. The finding involves the interrelationship between the use of a defendant's product at the workplace and the activities of the plaintiff at the workplace. This requires an understanding of the physical characteristics of the workplace and of the relationship between the activities of the direct users of the product and the bystander plaintiff. [citation omitted]. Within this context, the factors to be evaluated include the nature of the product, the frequency of its use, the proximity in distance and in time, of a plaintiff the use of a product, and the regularity of the exposure of that plaintiff to the use of that product. *See Robertson v Allied Signal, Inc.,* 914 F. 2d 360, 367-68 (3d Cir. 1990); *Lohrmann v Pittsburgh Corning Corp,* 782 F.2d 1156, 1162-63 (4th Cir. 1986).

Id. at 460.

This so-called "frequency, regularity, and proximity" test has been criticized as "not truly deal[ing] with the kind of relationship required between cause and effect. Instead, it addresses the kind of evidence required to support an expert's opinion." Bert Black and David H. Hollander, Jr., *Unravelling Causation: Back To the Basics,* 3 U. Balt. J. Envtl. L. 1, 10 (1993).

It is a rare toxic exposure case where the toxin and dose are identified and measured at the time of exposure. While the exposure may be proven by circumstantial evidence, this may still be problematic for plaintiffs. *See, e.g. McClelland v Goodyear Tire & Rubber Co*., 735 F. Supp 172 (D. Md. 1990), aff'd, 929 F. 2d 693 (4th Cir. 1991).

b. To a Particular Chemical

Plaintiff must prove that the injuries were caused by a particular chemical such as DES, Benzene, Asbestos, and that the particular chemical was manufactured or released by a specific defendant. *McClelland v. Goodyear Tire & Rubber Co.,* 735 F. Supp 172 (D. Md. 1990), aff'd, 929 F.2d 693 (4th Cir. 1991); *Aldridge v.* Goodyear, 34 F. Supp. 1010 (1999) (Plaintiffs failed to prove which, if any, of the chemicals that formed a "toxic soup" caused their specific injuries).

c. *Plaintiff suffered injuries*

It seems axiomatic that the plaintiff must have suffered an injury to state a cause of action. However, as discussed elsewhere, plaintiffs who have not suffered a present injury have multiplied dramatically. They may claim increased risk of disease or fear of disease. S*ee Pierce v Johns-Manville Sales Corp.,* 296 Md. 656, 464 A.2d 1020, 1026 (1983); *see, generally, Howard Ross Feldman*, Comment, *Chances As Protected Interests: Recovery for the Loss of a Chance and Increased Risk,* 17 U. Balt. L. Rev. 139 (1987). *Faya v Almaraz,329 Md. 435, 620 A.2d 327* (1993). They may claim medical monitoring. *Philip Morris, Inc. v Angeletti,* 358 Md. 689, 752 A. 2d 200, 251-252 (2000). Present injuries must reach a threshold of severity. Subclinical and cellular damage does not constitute a legally compensable injury. *Anchor Packing Co. v. Grimshaw,* 115 Md. App. 134, 692 A.2d 5 (Md. App. 1997).

d. *Compatible with those the chemical may produce*.

This element is perhaps the most complicated. It requires proof of general and specific causation. General Causation asks the question: Can the chemical at issue harm anyone? The Plaintiff must prove that the chemical is capable of causing harm and specifically, the type of harm that the plaintiff suffers. This must be done through expert testimony. In theory, the expert relies upon scientifically valid methodology to establish causation and then applies that methodology to the facts of the case. This may be difficult since many toxic substances are new or the diseases, such as cancer, are poorly understood. Further, given the long latency period associated with cancer, sufficient scientific evidence is not likely to be available in the near future.

Specific causation requires that the Plaintiff must prove that a particular defendant's product was the cause-in-fact of his/her harm. The exposure must have been the efficient cause or a substantial factor in the plaintiff's injury.

C. Proving Medical Causation Through Experts

Early retention of knowledgeable consultants and experts is essential in toxic tort litigation. Several areas of expert testimony include finding the source, exposure and length of exposure to the chemical, the general effects of the chemical, and the specific effect on the plaintiff of the toxin.

An industrial hygienist will assist counsel in determining the source of the exposure and its amounts. How do you find such an expert? The most highly qualified may be members of the American Industrial Hygienists Association. Obtain a list of "full" members of the AIHA. Beyond full membership, the AIHA offers the title of "Certified Industrial Hygienist" for those who have achieved certain experience and passed a written test.

A toxicologist may provide evidence as to the effects of the chemical and causation. Toxicologists may be members of the American Board of Applied Toxicology, the American Academy of Clinical Toxicologists, and the American College of Toxicologists. Bernard A. Goldstein and Mary Hennefin, Reference Manual on Sci. Evid. 181 (1994).

A neurologist, Pulmonologist, oncologist or radiologist may testify as to the injuries and specific medical causation. Check you local teaching hospitals.

A neuropsychologist/neuropsychiatrist may assess cognitive injury and can testify as to cognitive dysfunction. The neuropsychologist should not, however, be permitted to testify as to causation.

An Epidemiologist may testify as to general causation. Epidemiology is the:

> branch of medical science that studies the distribution of disease in human populations and the factors determining that distribution, chiefly by the use of statistics. Unlike other medical disciplines, epidemiology concerns itself with groups of people rather than individual patients and is frequently retrospective, or historical, in nature.

Encyclopædia Britannica Online (visited August 5, 2000)
< http://www.eb.com/bol/search?type = topic 3
query = epidemiology > .

"The most convincing evidence for human risk is a well-conducted epidemiological study in which a positive association between exposure and disease has been observed." Klaassen, *Casarett & Doll's Toxicology* 79 (5th ed. 1996). There are three major types of epidemiological studies: cross-sectional studies, prospective studies and cohort studies. Cross-sectional studies survey groups of humans to identify exposures and disease, but are not useful in establishing causation. *See* Id. Prospective studies monitor healthy individuals to determine whether they develop disease over a period of time. *See* Id. Cohort studies evaluate individuals selected on the basis of their exposure to the chemical under study and monitors them for the development of disease. *See* Id. The "epidemiological findings are judged by the following criteria: strength of association, consistency of observation (i.e. reproducibility in time and space), specificity (uniqueness in quality or quantity of response), appropriateness of temporal relationship (i.e. did the exposure precede the response?), dose responsiveness, biological plausibility and coherence, verification, and analogy (biological extrapolation)" *Id.*

Epidemiology focuses on the issue of general causation (i.e. is the chemical capable of causing disease?) rather than specific causation (i.e. did the chemical cause disease to this individual?). *See, e.g., Deluca v. Merrell Dow Pharmaceuticals, Inc*., 911 F.2d 941, 945 & n.6 (3d Cir. 1990) ("Epidemiological studies do not provide direct evidence that a particular plaintiff was injured by exposure to a substance.").

1. Animal Studies Offered To Prove General Causation

Toxicologists and other scientists offered to prove causation may base their testimony on study of humans or animals. When used alone, animal studies have produced controversy. Jack L. Landau & W. Hugh O'Riordan, of Mice and Men: the Admissibility of Animal Studies to Prove Causation in Toxic Tort Litigation, 25 Idaho L. Rev. 521, 521 (1988-1989). Scientists study the effect of chemicals on laboratory animals (in vivo research) because they obviously can not experiment on humans. They monitor the effect on the animals and compare them to control groups. Extrapolation of animal studies to humans really involves two types of extrapolation: First, extrapolating from one mammal (rats) to another (humans); and second, extrapolation from higher doses to lower doses. A large discrepancy in susceptibility may exist between test animal species. See Landau & O'Riordan, *supra*, at 543. *See, e.g., Saccharin Off Cancer List*, Washington Post, May 16, 2000 at A05 ("More than two decades after a study in rats prompted scientists to link saccharin to human cancer, the federal

government is dropping the artificial sweetener from its list of cancer-causing chemicals"). Studying the effect of chemicals on animals may be a good place to start research on the effect of chemicals on humans, but it is not a good place to end it. See Landau & D'Riordan, supra, at 521. This is true for several reasons. There are many differences between species, as chemicals may be toxic to one and not toxic to others. *See* Id. at 543. "Animals do not always respond to chemical exposure the same way humans do." Robert R. Lauwerys, Occupational Toxicology, Casarett & Doull's Toxicology 987 Kleessen, (5th ed. 1996).

In animal studies, toxicologists frequently use near toxic doses. See Landau & O'Riordan, supra, at sys. The courts are divided over whether animal studies are admissible.

> The problem with animal studies is the animals. Since *Daubert*, courts that have considered the issue almost uniformly have rejected data from animal studies offered as proof that an exposure caused an adverse human health effect when those studies are either contradicted or unconfirmed by human epidemiology.

Socha and Rzepiennik, All Journal Articles are not Created Equal: Guidelines for Evaluating Medical Literature, 67 Def. Couns. J. 61, 72 (2000). Studies that rely upon animal studies alone to prove causation are often excluded. *See, e.g., Gen. Elec. Co. v Joiner*, 522 U.S. 136 (1997) (PCB mice studies not helpful); *Nat'l Bank of Commerce v Dow Chem. Co*., 965 F. Supp. 1490 (E. D. Ark. 1996),

aff'd, 133 F. 3d 1132 (8th Cir. 1998); *Allen v Pennsylvania Eng'g Corp.*, 102 F. 3d 194 (5th Cir. 1996); *Wade-Greaux v Whitehall Labs, Inc.*, 874 F. Supp. 1441 (D.C. V.I. 1994), *aff'd*, 46 F. 3d 1120 (3d Cir. 1994); *Rayor v Merrell Pharm. Inc.*, 104 F. 3d 1371, 1441 (D.C. Cir. 1997) ; *Conde v. Velsicol Chem. Corp.*, 24 F. 3d. 809 (6th Cir. 1994); *Mascarenas v Miles Inc.*, 986 F. Supp. 582 (W.D. Mo. 1997). However, they are often admitted particularly when there is other evidence of causation. See ,e.g., *Marder v G. D. Searle & Co.,* 630 F. Supp. 1087, 1094 (D.Md. 1986) (admitted animal studies as relevant in resolving causation issue), *aff'd sub nom*, *Wheelahan v G. D. Searle & Co.*, 814 F. 2d 655 (4th Cir. 1987) ("There is a range of scientific methods for investigating questions of causation-for example, toxicology and animal studies, clinical research, and epidemiology-which all have distinct advantages and disadvantages."); *Villari v. Terminix Int'l, Inc.*, 692 F. Supp. 568, 571 (E.D. Pa. 1988); *In re Paoli R.R. Yard PCB Litig. v. Southeastern Pennsylvania Transp. Auth.,* 35 F.3d 717 (3d Cir. 1994) *cert. denied sub nom*, *Gen. Elec. Co. v. Ingram,* 513 U.S. 1190 (1995) (holding animal studies admissible in absence of human epidemiology, apparently persuaded by EPA reliance on animal studies to declare PCBs probable human carcinogen). Cases rejecting or minimizing the probative value of animal studies: *Brock v. Merrell Dow Pharmaceuticals, Inc.*, 874 F.2d

307, 313 (5th Cir. 1989), *cert. denied*, 494 U.S. 1046 (1990); *Richardson v. Richardson-Merrell, Inc.,* 857 F.2d 823, 830 (D.C. Cir. 1988), *cert. denied*, 493 U.S. 882 (1989); *Bell v. Swift Adhesives, Inc*., 804 F. Supp. 1577, 1579-80 (S.D. Ga. 1992); and *Cadarian v. Merrell Dow Pharmaceuticals, Inc*., 745 F. Supp. 409, 412 (E.D. Mich. 1989).

2. USING MEDICAL/SCIENTIFIC EXPERTS

a. Selection

Many toxic tort cases are battles of experts. Your case may succeed or fail simply on the strength of your experts. Thus, it is worthwhile to check the publications in the area, local hospitals and universities, governmental agencies, trade associations and your colleagues in the bar to identify the best experts available. In a carbon monoxide poisoning case, if you can find a neurologist who has authored 20 book chapters and 120 papers on carbon monoxide poisoning, his testimony will be powerful.

b. Manner of Use

Medical/Scientific experts can be used in three ways. First, as your instructor in toxicology/epidemiology/pulmonology/oncology/ or whateverology. You need to understand the science or medicine in order to develop your case. Counsel should probe the experts' theories to see whether they meet the “common sense” standard that

will be employed by the jury. Ask your expert to recommend authoritative texts and articles in the area under controversy. Second, use the expert as your consultant to help you draft discovery, to review opposing experts' reports, and to prepare for their depositions. Third, at trial, make sure that you research your expert so that you are not surprised with impeachment material that you could easily explain.

c. Preparation

Brief the expert at the beginning of the suit. Explain the litigation, the background of the adverse party's experts, tips for testifying and provide a factual review of the case. Let the expert know what his role is - that he isn't expected to testify as to all issues. Conduct a mock direct and cross-examination. Use a second attorney to make objections.

d. Direct Examination

Resist the temptation to just use a narrative. Asking specific questions keeps the witness focused and breaks up what could be a long, technical boring speech. Have the witness use charts, graphs and pictures to explain his testimony. It works as an outline and permits the jury to better understand the testimony.

e. Cross-examining experts

Counsel must develop a sound knowledge of the science involved before he can consider how best to examine opposing expert

witnesses. Cross-examination, like the rest of the trial, should focus on the theory of the case. If your theory is, for example, that the defendant acted reasonably under the circumstances and that the plaintiff is a hypochondriac, then you should bring this out on cross. You should consider crossing on bias, poor qualifications, and errors in case specific facts, such as plaintiff's other injuries.

While the opposing party's expert may not have a scientific basis for his testimony, you should consider whether to cross on this basis and risk confusing and losing the jury. If you believe there is not a reasonable chance of winning the case before the jury and the case is being tried for the appellate court, then a cross based upon lack of scientific methodology should be considered.

Example - Toxicologists

At trial, the plaintiff's toxicologist will frequently testify that the chemical at issue caused or exacerbated numerous ailments claimed by the plaintiff. Perhaps he will testify that a single molecule (the "single hit" theory) of that chemical may cause cancer. If the plaintiff does not yet have cancer, his risk of cancer has increased.

For non-cancer claims, focus on dose response. The plaintiff's expert will usually agree that all things are poisonous, as the toxicity is in the dose. We are exposed to dozens of chemicals every day in our homes and offices that do not harm us. Thus, you can focus on not

whether the chemical is inherently toxic or poisonous, to whether the dose that the plaintiff was allegedly exposed to was sufficient to cause injury.

For cancer cases, the toxicologists almost always focus on animal studies. Animal studies are frequently not admitted if they are the sole basis for proving causation. See Socha and Rzepiennik, All Journals Are Not Created Equal: Guidelines for Evaluating Medical Literature, 67 Def. Couns. J. 61, 72 (2000). The toxicologist will frequently concede that there is no consensus among toxicologist as to whether a chemical causing cancer when given in large doses to rodents will necessarily cause cancer in people when given in small doses. See Landau & D'Riordan, of Mice and Men: The admissibility of Animal Studies to Prove Causation in Toxic Tort Litigation, 25 Idaho L. Rev. 521, 545-546 (1988-1999). This is particularly true when the used on mice that were specifically bred to develop cancer. *See* Id. Even where the toxicologist testifies to the single hit theory, you should emphasize that it is merely one of many theories at play in the scientific community. If the expert testifies that the plaintiff is at increased risk of cancer, try to force him to be concrete. Is it an increase of one in a million or one in two million? Compare it to the increased risk of drinking commonly encountered substances like diet soda or beer.

Conclusion

Medical causation in Toxic Tort cases is much more complex than in standard tort cases. A knowledge of the issues, the science, and the law will pay off at settlement or trial.

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