Radiation Litigation Update:
Whiting v. Boston Edison Co.,
An Important Legal Development in Controlling Expert Testimony Based on “Junk Science”

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Abstract

Radiation litigation is a new and developing area of law. Court decisions are now shaping the rights and responsibilities of nuclear utilities vis-à-vis its nuclear workers. For example, many courts have held that the duty of care owed by a utility to its employees is the federal permissible dose limits, and that if a utility keeps a worker’s dose below those federal limits, the worker may not maintain a lawsuit against the utility. This rule, first published in O’Conner v. Commonwealth Edison, (748 F. Supp. 672 [C.D. Ill 1990] aff’d, 135 F.3d 1090 [7th Cir. 1994]) provides nuclear workers with a “very high level of protection from excessive exposure to radiation,” while at the same time providing a public utility with a “clear statement regarding how it may limit a worker’s dose without exposing the worker to injury or itself to liability” (O’Conner, 748 F. Supp. at 678). This rule further allows nuclear utilities that are sued by workers whose dose is below the federal limits to have the case dismissed early without being forced to defend itself through a full trial.

In response to the O’Conner case, plaintiffs seek to circumvent summary dismissal of their case by alleging that their dose exceeded the federal limits. In order to prove both that their dose exceeded the limits and, if successful there, to prove causation, the plaintiffs must use witnesses who have expertise in the areas of health physics and radiation epidemiology. One problem, however, is that some plaintiffs are using expert witnesses who offer “expert” scientific testimony that is neither expert nor scientific. That is, some so-called expert witnesses are not truly experts in the field, and have based their opinions on unscientific theories. Recently, in Whiting v. Boston Edison Co. (891 F. Supp. 12 [D. Mass., 1995]), when faced with this situation, a federal court in Massachusetts created new precedent in radiation litigation by fashioning rules of law that allowed it to “screen” the experts’ testimony before allowing a jury to hear them. Because the Judge determined that the expert witnesses did not “qualify” as experts in the specialized field of health physics, and radiation causation, and because the experts’ opinions were not based on “good science,” the Court excluded the experts from testifying. Consequently, the Court dismissed the case without subjecting the utility to a jury trial. This article discusses the principles established by the Whiting case, and how Whiting may affect future radiation cases.

Key Words
causation
Daubert
dose
epidemiology
expert witness
junk science
linear hypothesis
radiation litigation
regulations

* The Third Circuit Court of Appeals recently adopted the federal numerical permissible dose limits for off-site releases exposing the general public. In re TMI Litigation, No. 94-7599, slip op. at 19 (3rd Cir. Oct. 11, 1995).
Factual Background

Gary Whiting worked at the Pilgrim Nuclear Power Plant from August 1977 to May 1980. He developed Acute Lymphocytic Leukemia (ALL), a rare form of leukemia, and died at the age of 31 in 1983. Mr. Whiting’s dose of record, as measured by his TLDs, was 6.249 rem for the three year period he worked at Pilgrim. Mr. Whiting’s wife filed a lawsuit against the licensee, Boston Edison Company, alleging that Mr. Whiting’s occupational exposure to radiation caused her husband’s ALL and death.

Boston Edison filed a pretrial motion, (technically, a motion for summary judgment), asking the court to dismiss plaintiffs’ lawsuit on the basis that his radiation dose was within the federal limits. The judge’s role is to determine questions of law, such as admissibility of evidence, or what is the duty of care owed to a nuclear worker; the jury’s role is to determine questions of fact, such as what dose the plaintiff received. In response to defendant’s motion for summary judgment, plaintiffs filed an affidavit by their epidemiology “expert,” Dr. Stuart L. Shalat, stating that Mr. Whiting’s radiation dose exceeded the federal limits, and caused his ALL.

In deciding the motion for summary judgment, the court adopted the O’Conner holding, making the legal determination that the duty owed to the nuclear worker was the federal limits. If Mr. Whiting’s dose was below the federal limits, the case would be dismissed. However, the court also determined that the plaintiff’s dose was a question of fact that had to be decided by a jury. Accordingly, the judge denied Boston Edison’s motion and held that the jury had to resolve whether Mr. Whiting’s dose actually exceeded the limits.

Before going to trial, however, Boston Edison filed a motion to exclude plaintiffs’ key experts, Dr. Stuart Shalat, an epidemiologist, and Dr. Thomas Winters, a physician who is board certified in internal and occupational medicine. Boston Edison argued that they were not qualified to testify in the specialized areas of health physics or radiation causation, and that there was no scientific support for their opinions that low levels of radiation caused Mr. Whiting’s ALL. The Court held a "Daubert" hearing in order to determine these issues. This is a procedure, named after a recent Supreme Court case called Daubert v. Merrell-Dow Pharmaceuticals Inc., (113 S.Ct. 2786 [1993]) in which the Supreme Court authorized federal trial judges to act as "gatekeepers." The Court instructed lower court judges to evaluate expert testimony in order to ensure that the fact finding process does not become distorted by “junk science.”

Similarly, such a gatekeeper role was important to control juror misunderstanding of important scientific issues, and to curtail “the potential for exaggeration and fraud on the court” (Elkins v. Richardson-Merrell, Inc., 8 F.3d 1068 [6th Cir. 1994]).

Legal Background of Standards for Admitting Expert Witnesses and Expert Testimony

Historically, the threshold for qualifying as an expert in court was very low; most courts would allow any person whose knowledge is "beyond the ken of the average layman" to testify. Thus, a person qualified by reason of "knowledge, skill, experience, training, or education" could testify in court (Federal Rule of Evidence 702). Under this rule, a person who did not have a medical degree, but who had simply "studied" medicine on his own, could offer a medical opinion in court. Moreover, the philosophy of the courts was that the jury had to determine the credibility of

† Junk science is an apparently “scientific opinion” which would not be able to withstand the normal scientific publication peer review process, but yet is offered in court to “assist” laymen in the resolution of a difficult legal problem.
expert witnesses; if an expert testified without a sufficient scientific basis, it was up to the opposing attorneys to expose this on cross examination. Unfortunately, if a jury believed the witness, despite the unscientific nature of his opinion, the court’s hands were tied. In most cases the court could not, or would not, invade the province of the jury by excluding expert testimony. In the past, this has led to absurd results. For example, in Swanson v. Pacific Shipping Co., (1910), the jury credited an expert opinion linking “gangrene of the lungs” to the plaintiff having been struck in the head and shoulders by a board thirteen months earlier, and in Schultz v. St. Louis-San Francisco Railway Co. (1928), the jury awarded damages based on the testimony of an “expert” that a skull fracture caused plaintiff to suffer influenza. It is not hard to imagine how in a radiation litigation case, a jury that holds the same misperceptions about radiation that the general public holds could easily be misled by an “expert” who provides unscientific testimony that merely inflames their passions.

In response to the unjust and absurd results that followed allowing unscientific testimony in the courtroom, the Supreme Court in Daubert held that the trial judge has the responsibility for keeping “junk science” out of the courtroom (See e.g., Wilson v. City of Chicago, 6 F.3d 1233, 1239 [7th Cir. 1993]). The Daubert Court recognized that something doesn’t become scientific knowledge just because it is uttered by a scientist; nor can an expert’s self-serving assertion that his conclusions were derived by the scientific method be deemed conclusive. It further reasoned that, “scientific implies a grounding in the methods and procedures of science” (Id. at 2795).

The term knowledge, “applies to any body of known facts or to any body of ideas inferred from such facts or accepted as truths on good grounds” (Daubert at 2795 [quoting Webster’s Third New International Dictionary, 1252 [1986]]. The Court concluded therefore, that expert testimony must be grounded in the methods and procedures of “good science.”

The Supreme Court directed trial courts to make a preliminary assessment of whether the reasoning or methodology underlying the testimony is scientifically valid and whether that reasoning or methodology properly can be applied to the facts in issue. To do this, courts should use four factors.

First, the court must examine whether theory or technique can be (and has been) tested. “This methodology is what distinguishes science from other fields of human inquiry” (Daubert, 113 S.Ct. at 2796-97).

The Daubert Court explained:

“Scientific methodology today is based on generating hypotheses and testing them to see if they can be falsified; indeed, this methodology is what distinguishes science from other fields of human inquiry” (Daubert, 113 S.Ct. at 2796-97). Therefore, statements by experts constituting a scientific explanation must be capable of empirical testing. If the theory can be proven false, it is falsified. If the theory can be proven true, it is validated. If neither can be done, it remains a theory. If a hypothesis or model cannot be presently verified or validated it does not amount to scientific knowledge and must be excluded (Wade-Greaux, 1994 WL 80840 at 37; Johnston v. United States, 597 F. Supp. 334, 393-94 [D. Kan., 1984]).

Second, a trial court must determine whether the theory or technique has been subjected to peer review and publication. The Daubert Court stated:

“[S]ubmission to the scrutiny of the scientific community is a component of ‘good science,’ in part because it increases the likelihood that substantive flaws in methodology will be detected. . . The fact of publication (or lack thereof) in a peer-reviewed journal thus will be a relevant, though not dispositive, consideration in assessing the scientific validity of a particular technique or methodology on
received between August 11, 1979 and August 21, 1979, when Whiting was not even working at Pilgrim. Similarly, Shalat attributed doses totaling 175 millirad to Whiting on days after he had permanently quit work at Pilgrim" (Id. at 18 [emphasis added]).

Through cross examination, the defendant demonstrated that Dr. Shalat had made dozens of mathematical errors rendering his opinion unreliable. The Court agreed:

The data used in the compilations are similarly flawed . . . In applying his formula, Dr. Shalat made simple mathematical errors while performing forty-four of his seventy-four calculations . . . that opinion is so riddled with factual inaccuracies and unproven assumptions that no reasonable jury could give his opinion credence (Id. at 19 [emphasis added]).

These errors resulted in a dose number that was approximately three times that measured by the TLDs. Significantly, the Court determined that no expert can simply develop his own formula and apply it in order to inflate a radiation dose. The Court stated:

In estimating Gary Whiting’s total dose, Shalat used a formula of his own invention . . . While the formula is superficially impressive, it incorporates arbitrary assumptions involving Gary Whiting’s presumed entry and exit times, the diffusion of radiation within his working areas, his actual movements, the time it took him to suit up and desuit, and his proximity to “hot spots” . . . In sum, putting aside the issue of whether Dr. Shalat is qualified to offer an opinion as to Whiting’s whole body exposure to radiation, his explication of that opinion is so riddled with factual inaccuracies and unproven assumptions that no reasonable jury could give his opinion credence” (Whiting at 19 [emphasis added]).

The Court also excluded Dr. Shalat’s causation opinion. It stated:

“(Dr. Shalat claims no medical expertise beyond that possessed by a general epidemiologist.) Epidemiology, as Dr. Shalat acknowledges, does not pretend to make person-specific diagnoses; the best it can do is assign a probability (odds) that a particular disease in a particular person was caused by a given agent” (Id. at 20, note 30).

Dr. Thomas Winter’s Causation Testimony

The defendant also sought to exclude Dr. Winters, plaintiff’s other causation expert. Dr. Winters is board certified in internal and occupational medicine. Dr. Winters testified that Mr. Whiting’s radiation dose was the proximate cause of his development of ALL. Dr. Winters claimed to use a “clinical method” and a “species” of differential diagnosis to reach his causation opinion.

Dr. Winters’ opinion contained the following assumptions. First, he assumed that cancer does not occur naturally, but is induced by environmental factors such as x rays, radiation, and electromagnetic radiation. Second, Dr. Winters assumed that the linear nonthreshold hypothesis was a fact. He thus testified that any exposure to any amount of radiation “from zero up,” can “increase the risk of cancer.” Dr. Winters “eliminated” any other possible alternative explanations for Mr. Whiting’s development of ALL. Finally, Dr. Winters examined the scientific literature and claimed that studies such as Wing, Stevens and Wilkenson provided epidemiologic support for his theory that exposure to 6.25 rem more likely than not induced Mr. Whiting’s ALL (Id. at 22).

The Court’s Ruling Regarding Dr. Winters

The Court concluded that Dr. Winters was not qualified to offer a causation opinion, and that his conclusion was not grounded in good science. As to Dr. Winters’ lack of qualifications, Dr. Winters had not demonstrated any
expertise in leukemia, oncology and hematology, or radiation epidemiology.

As to his causation opinion, the Court carefully scrutinized the epidemiologic studies on which Dr. Winters purportedly relied. Relying on defendant's cross examination of Winters, as well as the testimony of various expert radiation epidemiologists who testified for the defense, the court reasoned that BEIR V, as well as other valid epidemiologic studies, did not support the conclusion that doses of 6.25 rem statistically increased the incidence of ALL in populations. Rather, the Court concluded, as Dr. Winters conceded, "that in the Japanese atomic bomb survivor studies no statistical correlation to excess incidence of leukemia was demonstrated below a dose level of 40 rem to the bone marrow and 100 rem in the case of ALL" (Whiting at 21).

Further, the Court distinguished low dose studies from high dose studies and stated that they "either do not support his opinion that ionizing radiation in the 5- to 10-rem dose range can cause ALL in adults, or they are marred by generally acknowledged flaws in their methodology" (Whiting at 21).\(^\d\)

The Court also found fault with Dr. Winters' reliance on the linear non-threshold hypothesis. The Court reasoned:

"In the absence of validation data, Dr. Winters' opinion reduces itself to faith in a linear non-threshold model of the causal relationship between ionizing radiation and leukemia. In layperson's terms, the model assumes that if a lot of something is bad for you, a little of the same thing, while perhaps not equally bad, must be so in some degree. The model rejects the idea that there might be a threshold at which the neutral or benign effects of a substance become toxic. While this may be true, say of cigarettes, it is not true of, for example, aspirin. Whether it is true of ionizing radiation and ALL was one of the major challenges posed to the BEIR panels. The BEIR V Committee decided to adopt a linear quadratic non-threshold model as an experimental predictor for ALL. What must be kept in mind is that both models, although radically different in their estimates of risk, are attempts to extrapolate from the known to the unknown, something that neither model does very well with ALL." (Whiting at 22 [emphasis added]).

The Court also noted that the "linear non-threshold model cannot be falsified, nor can it be validated" (Id. at 25). It was merely a hypothesis used by Dr. Winters' whose opinion was "grounded on speculation shaped by result-oriented biases" (Id. at 25).

The Daubert hearing in Whiting eliminated the two key expert witnesses for the plaintiffs. Once these two expert opinions were excluded, the plaintiff had no expert testimony with which to prove Mr. Whitings' dose exceeded the limits or causation. Accordingly, the Court dismissed the case without holding a jury trial. Using this strategy, Boston Edison was able to avoid the risk of having a jury of laypersons make decisions based upon unscientific testimony of witnesses who had no real expertise in the relevant scientific disciplines.
The Significance of the Whiting Decision on Future Radiation Cases

The Whiting decision has the potential to significantly affect the outcome of future radiation cases. A defendant utility is not necessarily destined for a jury trial if it cannot win summary judgment based on its contention that the plaintiff's dose did not exceed the federal dose limits. Whiting stands for the proposition that a utility can challenge the qualifications and bases of plaintiffs' expert's opinion before a jury trial. If successful at that pretrial stage, the utility need not expose itself to the potential of a large jury verdict.

Whiting is also significant because it demonstrates that a judge can listen carefully to complex evidence concerning health physics, dosimetry and radiation epidemiology, and can discern between valid and fringe scientists, and between reliable methodologies and junk science. Having done so, the judge may exclude that testimony.

Whiting also establishes some important principles that, if followed by other courts, may help future utilities when faced with similar issues. For example:

- A dose reconstruction must be performed by one with expertise in that specific field and is used only in the absence of primary dosimetry. The Whiting Court recognized that:

  Health physics and dosimetry are complex scientific fields which requires years of specialized training, education, knowledge and experience before competency can be achieved. Health Physicists are board certified just as medical doctors are board certified. [HP techs] are not professional health physicists . . . They would be similar to the x-ray technician at a local hospital who is competent to operate the x-ray machine . . . but who is not competent to interpret the resulting image as would be a radiologist . . . (Whiting at 17, n. 17).

This is significant because it may preclude future witnesses who are not health physicists from testifying as experts in the specialized fields of health physics.

- A dose reconstruction is appropriate only when primary data from TLDs and SRPDs are not available. The Court stated:

  "Only in the absence of primary or secondary data is dose reconstruction performed . . . Plaintiff has not brought to the court's attention any peer support for Dr. Shaiat's departure from the accepted methodology of dose reconstruction or any evidence of a convincing nature justifying a lack of confidence in the relevant dose records" (Whiting at 18, n. 24). Thus, a court that chooses to follow the decision in Whiting may hold that if a plaintiff's dose was actually measured, a plaintiff may not substitute a dose "reconstruction" for the actual measured dose. This underscores the importance of both implementing an effective dosimetry program that accurately measures dose and maintaining dose records in retrievable, legible form. If a plaintiff's dose was not accurately measured or if the pertinent dose records are missing or illegible, then plaintiff will be entitled to introduce his expert's own dose reconstruction which will undoubtedly artificially inflate the dose. Moreover, if utilities are attempting to save money now by eliminating or reducing the cost of badging workers or employees whose doses are expected to be below ten percent of the annual limits, (10 CFR § 20.1502), and one of those workers sues, it is likely that the worker would be allowed to introduce his own dose reconstruction since his dose was not measured by the utility. The utility may be opening itself to the allegation that it was "trading dollars for lives" when it consciously chose to save money rather than spending a "few dollars" to measure...
the “deadly radiation” to which plaintiff was exposed. It may be wiser in the long run to spend the money on person-specific dosimetry now, rather than spend more resources litigating a claim later.

- Epidemiology is concerned with group truth, not person specific truth. That is, epidemiologists determine whether there is an increased incidence of a particular disease in a population; they do not determine the cause of a specific person’s disease. Thus, an epidemiologist is not qualified to opine that a specific person’s disease was caused by specific radiation exposure, other than to calculate group odds and presume that they apply to an individual.

- In order to state that a specific radiation dose caused a specific disease, expert witnesses must base their opinion on epidemiologic studies demonstrating a statistically significant number of excess cases of the same disease caused by radiation. Plaintiffs cannot merely rely on low dose studies showing a statistically insignificant increase in a disease to prove that radiation causes that disease.

- The linear nonthreshold hypothesis is a theory that is appropriate for use in predicting risks and setting standards, but it is not a fact that is appropriate for determining legal liability. The Whiting Court stated:

“As the name itself notes, this [linear hypothesis] is not proven fact. It is only a hypothesis. Webster’s Dictionary tells us that any hypothesis is ‘a tentative assumption made in order to draw out and test its logical or empirical consequences.’ A hypothesis is synonymous with a theory. Consequently, any hypothesis or theory is not fact until it has been scientifically proven. Anyone who has been trained in the scientific method realizes that a hypothesis is a scientist’s educated speculation ... It is important to underscore again that a court of law is not a scientific experiment. When a court of law determines responsibility for human suffering and awards damages, it must do so based upon reasonable evidence, not just speculation or hypothesis. Just because scientists use hypotheses to describe something they really don’t know for sure does not justify a court of law in using speculative hypotheses to determine that one person has caused harm to another” (Whiting, at 25 n. 56 [quoting Johnston v. United States, 597 F. Supp. 374, 393-394] [D. Kan. 1984]).

Conclusion

Radiation litigation is a dynamic field of law. It grows each time a case is decided. O’Connor was a very important step towards introducing more rationality in the standards by which exposures are judged. Whiting is an equally important step towards obtaining more rationality in the courts’ examination of the qualifications and bases for an expert’s opinion.
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