

**UNITED STATES DISTRICT COURT
DISTRICT OF MASSACHUSETTS**

**LAURA ALLEN, individually, as
administratrix of the estate of DANIEL
ALLEN, and as next friend of TAYLOR
ALLEN and DANIELLE ALLEN, and
MARK ALLEN,**

Plaintiffs,

v.

**MARTIN SURFACING, a division of
SOUTHWEST RECREATIONAL
INDUSTRIES; SOUTHWEST
INDUSTRIES; and SOUTHWEST
RECREATIONAL INDUSTRIES, INC.,
d/b/a MARTIN SURFACING,**

Defendants.

**Civil Action No.
05-40048-FDS**

**MEMORANDUM AND ORDER ON
CROSS-MOTIONS CONCERNING EXPERT TESTIMONY**

SAYLOR, J.

This is a negligence and wrongful death action arising out of the death of Daniel Allen, the former head football coach of the College of The Holy Cross in Worcester, Massachusetts. Plaintiffs are the surviving spouse and children of Allen. Defendant is the company hired to resurface the gymnasium floor of the Field House at Holy Cross.¹ Jurisdiction is based on diversity of citizenship.

¹ Though the case caption in this matter lists “defendants,” because Martin Surfacing is a division of Southwest Recreational Industries there is, for legal purposes, only one defendant: Southwest Recreational Industries. The Court takes plaintiffs’ references to Martin Surfacing as being to Southwest Recreational Industries.

Allen died from amyotrophic lateral sclerosis (“ALS”), commonly known as Lou Gehrig’s disease, on May 16, 2004. Plaintiffs allege that in the spring of 2001 defendant exposed Allen to neurotoxic levels of toluene, a chemical in materials used to resurface the gymnasium floor in the Holy Cross Field House, the building that housed Allen’s office. Plaintiffs do not contend that toluene causes ALS or caused Allen to develop ALS. Rather, they contend that Allen was predisposed to developing ALS and that his exposure to neurotoxic levels of toluene accelerated both the development of ALS symptoms and the course of the condition. Plaintiffs further contend that defendant was negligent in failing to properly warn Allen and his staff of the dangerous propensities of the materials they were using, as well as the need to keep out of the building during the resurfacing process.²

Plaintiffs have identified four expert witnesses in this matter: Marcia Ratner, Ph.D., a neurotoxicologist; Christine Oliver, M.D., a physician who specializes in occupational medicine; William Ewing, C.I.H., an industrial hygienist; and Richard Clapp, D.Sc., M.P.H., an epidemiologist. Defendant has identified Dean Hashimoto, M.D., a physician who also specializes in occupational medicine.

There are several motions pending before the Court, all of which concern proposed expert testimony. Specifically, plaintiffs have moved to include their causation experts’ testimony in full at trial. Defendant filed three motions for summary judgment and/or to preclude the expert

² The third amended complaint alleges the following thirteen claims: Count One—General Negligence; Count Two—Negligent Failure to Warn; Count Three—Loss of Consortium and Other Relief (Mass. Gen. Laws ch. 229); Count Four—Conscious Pain and Suffering; Count Five—Wrongful Death Caused by Grossly Negligent Conduct; Count Six—Violation of Mass. Gen. Laws ch. 93A; Count Seven—Wrongful Conduct; Count 8—Strict Liability; Count 9—Breach of Express Warranty; Count 10—Breach of Implied Warranty; Count 11—Negligent Infliction of Emotional Distress; Count 12—Intentional Infliction of Emotional Distress; and Count 13—Defective Design, Manufacturing, and Distribution.

testimony of Dr. Ratner, Dr. Oliver, and Mr. Ewing pursuant to Fed. R. Evid. 702.³ Beginning on January 7, 2008, the Court held a three-day hearing with testimony from both plaintiffs' and defendant's experts about their opinions in this case.

This case presents a somewhat unusual set of circumstances. The experts proffered by plaintiffs are generally well-qualified by education, training, and experience, and the substance of their testimony hardly qualifies as "junk science." Nonetheless, their conclusions (whether viewed independently, or taken as a whole) approach the limits of admissible testimony, at the point where scientific fact, and scientific reasoning, begin to fade into theory and speculation. After careful review, and for the reasons set forth below, the Court has concluded that the testimony is on the proper side of the boundary, and will therefore be admitted. Any weaknesses in the foundations of those opinions will therefore be tested by the adversary process, rather than excluded from the jury altogether. Accordingly, and with the exception noted below, the Court will deny defendant's motions and grant plaintiffs' motion.

I. Background

Daniel Allen was the head football coach at The College of the Holy Cross in Worcester, Massachusetts, until shortly before his death in 2004. In the spring and summer of 2001, Allen was 45 years old and in apparently good physical health. He had no history of ALS in his family. Allen's office at Holy Cross was located on the second floor of the Field House.

In 2001, Holy Cross contracted with Southwest Recreational Industries, d/b/a Martin Surfacing, to install Versaturf "360," a new flooring system for the gymnasium located in the

³ On December 14, 2007, defendant filed a motion to strike certain testimony of Christine Oliver. That motion is the subject of a separate memorandum and order.

Field House. Employees of Martin Surfacing began their work on the gymnasium floor starting in May and continuing into early June 2001. The resurfacing process made use of several solvents and chemicals, including toluene. The process took at least one full work week to complete, during which time Allen was present in his office. At no time did Martin Surfacing or its employees inform Allen, or any of his colleagues in the Field House, of the toxic nature of the chemicals used or of any precautions he should take while the chemicals were in use. Throughout the resurfacing process, Allen experienced symptoms of dizziness, headaches, and disorientation. Members of his staff, who also had offices in the Field House, suffered similar symptoms.

In the months after the resurfacing, Allen experienced symptoms of fatigue and weakness, for which he sought medical advice from his primary care physician and, eventually, a neurologist. By September 2001, he had developed fasciculations (small, local, involuntary muscle contractions or twitching visible under the skin) in his lower extremities, which later spread to his upper extremities. He was formally diagnosed in January 2002 as having a motor neuron disease, likely ALS. He became wheelchair-bound in the spring of 2003. His condition continued to worsen throughout 2003 and early 2004, and he passed away on May 16, 2004.

There are two forms of ALS: familial, which is linked to a person's genetic makeup, and sporadic, which has no known cause.⁴ The National Institute of Neurological Disorders and Stroke defines ALS as "a rapidly progressive, invariably fatal neurological disease that attacks the nerve cells (neurons) responsible for controlling voluntary muscles." (Dkt. No. 54, Memorandum in Support of Plaintiffs' Motion to Fully Include Their Causation Experts' Testimony at Trial ("Pl.

⁴ Because Allen has no known family history of ALS, the parties agree that Allen suffered from sporadic ALS.

Mem.”) Tab 2a at 8-9.) Although ALS destroys the muscle control of an individual, the disease does not affect the ability to see, smell, taste, hear, or feel, nor does it normally impair cognitive abilities. During the course of ALS, the upper and lower motor neurons degenerate or die, losing their capacity to send messages to muscles. Without any stimulation to move, the muscles gradually weaken and waste away; this state is generally marked by muscle contractions or twitches. As ALS progresses, the brain ceases being able to start or control voluntary movement. Individuals with ALS are slowly deprived of their strength and the ability to move their arms, legs, and body. Eventually, the muscles in the diaphragm and chest wall fail, and individuals lose the ability to breathe without ventilatory support.

The parties do not dispute that Allen had sporadic ALS. Nor do they dispute the fact that exposure to toluene does not *cause* ALS. Rather, the parties dispute the reliability of plaintiffs’ expert witnesses’ testimony as to whether exposure to toluene can hasten the early onset and progression of ALS in an individual predisposed to the disease.

II. Analysis

A. Fed. R. Evid. Rule 702

The admissibility of expert testimony is governed by Fed. R. Evid. 702. That rule provides:

If scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education, may testify thereto in the form of an opinion or otherwise, if (1) the testimony is based upon sufficient facts or data, (2) the testimony is the product of reliable principles and methods, and (3) the witness has applied the principles and methods reliably to the facts of the case.

Rule 702 codifies the *Daubert* line of cases, in which the Supreme Court defined the trial courts’

“gatekeeping” function “in regulating the admissibility of expert testimony.” *United States v. Diaz*, 300 F.3d 66, 73 (1st Cir. 2002) (citing *Daubert v. Merrell Dow Pharm., Inc.*, 509 U.S. 579, 589-95 (1993) and *Kumho Tire Co. v. Carmichael*, 526 U.S. 137, 141, 147-49 (1999)).

This gatekeeping function of the Court requires a preliminary evaluation of both the reliability and the relevance of the proffered expert testimony. *Id.* When faced with a proffer of expert testimony, the Court must consider three issues: (1) whether the proposed expert is qualified by “knowledge, skill, experience, training or education;” (2) whether the proposed subject matter of the expert opinion properly concerns “scientific, technical, or other specialized knowledge;” and (3) “whether the testimony is helpful to the trier of fact, *i.e.*, whether it rests on a reliable foundation and is relevant to the facts of the case.” *Bogosian v. Mercedes-Benz of N. Am., Inc.*, 104 F.3d 472, 476 (1st Cir. 1997).

In evaluating the reliability of scientific evidence, the Court must determine “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.” *Daubert*, 509 U.S. at 592-93; *Diaz*, 300 F.3d at 73. In *Daubert*, the Supreme Court delineated several factors a court may consider in undertaking its reliability analysis: (1) whether the scientific theory or technique can be (and has been) tested; (2) whether the theory or technique has been subjected to peer review and publication; (3) whether a particular technique has a known potential rate of error; (4) whether there exists or are maintained standards controlling the technique’s operation; and (5) whether the theory or technique is generally accepted in the relevant scientific community. *Daubert*, 509 U.S. at 593-94; *see* Fed. R. Evid. 702 Advisory Committee Note to 2000 Amendments. These factors do not function as a definitive checklist for admissibility, and no

single factor will dispose of the reliability inquiry. *See id.* at 592-95; *Anello v. Shaw Indus.*, 2000 WL 1609831, at *3 (D. Mass. Mar. 31, 2000).

In evaluating the relevancy of the scientific evidence, the Court must determine whether the expert testimony is relevant, “not only in the sense that all evidence must be relevant, but also in the incremental sense that the expert’s proposed opinion, if admitted, likely would assist the trier of fact to understand or determine a fact in issue.” *Ruiz-Troche v. Pepsi Cola of Puerto Rico Bottling Co.*, 161 F.3d 77, 81 (1st Cir. 1998) (internal citation omitted). In other words, Rule 702 “requires a valid scientific connection to the pertinent inquiry as a precondition to admissibility.” *Id.* at 592; *Cipollone v. Yale Indus. Prods., Inc.*, 202 F.3d 376, 380 (1st Cir. 2000) (describing the “ultimate purpose of the *Daubert* inquiry” as determining the testimony’s helpfulness to the jury).

The Rule 702 inquiry “is a flexible one, and there is no particular procedure that the trial court is required to follow in executing its gatekeeping function.” *Diaz*, 300 F.3d at 74 (citation and internal quotation marks omitted). The court enjoys “substantial discretion” in deciding whether to admit or exclude relevant expert testimony. *Mitchell v. United States*, 141 F.3d 8, 15 (1st Cir. 1998) (citing *General Elec. Co. v. Joiner*, 522 U.S. 136 (1997)). Of course, the focus of the court’s inquiry should be on the principles and methodology employed by the expert, not the ultimate conclusions. *Daubert*, 509 U.S. at 595. The court must also evaluate carefully whether the challenge to the expert testimony goes more to the weight of the proffered opinion, rather than its admissibility. *See Ruiz-Troche*, 161 F.3d at 85 (stating that the lack of peer-reviewed publications supporting the expert’s opinion, alone, was not enough to disqualify its admissibility because the opinion rested upon good grounds generally and should be tested by the “adversarial

process”); *Mitchell*, 141 F.3d at 15 (stating that expert’s lack of specialty practice in the area about which he testified went to weight not admissibility).

With these principles in mind, the Court will summarize the testimony and reports of the challenged experts and evaluate the parties’ arguments for including or excluding the testimony.

B. Defendant’s Challenge to William Ewing’s Testimony

Plaintiffs offer the testimony of William Ewing to establish the concentration and duration of Allen’s exposure to toxic levels of the solvent mixture used in resurfacing the gym floor. Ewing testified on the process by which defendant refinished the Field House floor, the chemicals used during this process, and the industrial-hygiene issues involved. Ewing concluded that Allen was exposed to significant concentrations of solvent vapors during the refinishing of the floor. Defendant challenges the admissibility of Ewing’s testimony on two primary grounds: (1) that he is not qualified to give expert testimony in this matter; and (2) that his conclusions are not reliable because they fail to meet the Rule 702 standard for scientific evidence.

1. Qualifications

William Ewing is an industrial hygienist with almost thirty years of experience.⁵ Currently, he is the Technical Director for Compass Environmental, Inc., a consulting firm that conducts industrial hygiene studies for governmental entities and private companies. As Technical Director, Ewing’s “responsibilities include preparation of industrial hygiene study designs, conducting field work, preparation of reports and training materials, quality control, and review of other industrial hygienists’ work.” (Pl. Mem. Tab 5 at 1.)

⁵ Industrial hygiene is the field devoted to the identification, evaluation, and control of health hazards in the workplace.

Ewing received a Bachelor of Science degree from Washington and Lee University in 1978. He completed an apprenticeship and passed his core industrial hygienist examination in 1980. In 1983, he was certified by the American Board of Industrial Hygiene. In 1993, he passed the sub-specialty examination in Indoor Environmental Quality. He has maintained his certification since that time. Since his original certification, he has taken courses in industrial hygiene, toxicology, environmental assessments, and indoor air quality. He has taught courses and delivered numerous lectures on the field of industrial hygiene, in addition to authoring several published articles and reviews.

Currently, Ewing is a member of the American Industrial Hygiene Association ("AIHA"), the American Conference of Governmental Industrial Hygienists ("ACGIH"), the National Institute of Building Sciences, the American Society for Testing and Materials, the International Society of Indoor Air Quality and Climate, and several other professional or technical organizations. He serves on the AIHA's Indoor Environmental Quality Committee, which he previously chaired. He is also a member of AIHA's Practices, Standards, and Guidelines Committee, and served as its chair in 2004. He was recognized as a Fellow of the AIHA in 1995.

Most of Ewing's work has focused on the identification, evaluation, and control of airborne contaminants. This includes anticipating the release of contaminants during various work activities, determining pathways of exposure, measuring exposures to workers and bystanders, and controlling exposures. He is knowledgeable with respect to general and local exhaust ventilation principles, design, and operation. He is familiar with the regulations affecting workers' exposures to chemicals promulgated by the Occupational Safety and Health Administration ("OSHA"), as well as the recommended practices and guidelines set forth by the National Institute

for Occupational Safety and Health and other organizations. Over his thirty-year career, he has conducted several hundred facility surveys where chemical exposures were at issue.

Defendant challenges Ewing's qualifications as an expert to testify regarding the nature of the chemicals used in the resurfacing process, as well as regarding Allen's potential exposure to such chemicals during the resurfacing project. According to defendant, Ewing is not qualified in the *specific* subject for which his testimony is offered. See *Whiting v. Boston Edison Co.*, 891 F. Supp. 12, 24 (D. Mass. 1995). The Court disagrees. Ewing has a thorough background of knowledge and experience in industrial hygiene, and he has the training and practice necessary to perform chemical exposure surveys. The fact that he may not have a specific expertise in toluene, or toluene exposure, is not sufficient, at least in this context, to require his exclusion. Accordingly, the Court concludes that Ewing is qualified, within the meaning of Rule 702, to offer an expert opinion on the nature of the chemicals used as part of the resurfacing process, as well as the amounts and concentration of volatile compounds in the air of the Field House during the resurfacing of the gym floor.

2. Opinion

Ewing concluded that, although he was unable to determine whether Allen's exposure to any *particular* chemical exceeded guideline exposure limits, he found it likely that Allen's exposure to the *mixture* of solvents used in the resurfacing process bordered on or surpassed applicable guideline limits. In both his expert report and his testimony before the Court, Ewing explained the basis for his conclusion, including the information he relied on,⁶ the methodology he

⁶ To reach his conclusions, Ewing reviewed the following information: (1) affidavits from Allen's coworkers and an employee who resurfaced the floor of the Field House; (2) a video taken during a visit to the Field House on May 14, 2007; (3) deposition testimony; (4) the technician's manual, as well as relevant guidelines

used, and his reasoning. He described the layout of the Field House, including the location of the gym in relation to the offices, the ventilation systems, and the air flow of the facility. He also provided a detailed explanation of the resurfacing process. As part of this review, Ewing discussed the chemicals in the solvent mixture used during each step of the process, the duration of the process, and how much of the volatile organic compounds (“VOCs”) would likely be released into the air. Finally, Ewing discussed why he was unable to determine the precise amounts or the duration of Allen’s exposure.

The standard in the field of industrial hygiene, as Ewing described it, is to rely first on direct measurement. Ewing was not able to consider air sampling data because none was taken during the Field House project and because there were no sampling numbers from defendant’s other projects.⁷ Where air sampling data is unavailable, industrial hygienists turn to modeling to determine the concentration of chemicals in the air.

Ewing concluded that there were at least three pathways of exposure from the Field House gymnasium to the upper offices, where Allen and his coworkers were located. The first pathway was via the first floor offices that return air to the air handler mixing box, which redistributed the air to the three office areas. The second was through leakage into the return air duct and points upstream from the air-handling unit located in the gymnasium proper. The third was through simple air migration from space to space. Based on the ventilation design for the

and specifications for the installation of the Versaturf “360” floor; (5) technical data, diagrams, and parts for Graco, Inc., airless sprayers; (6) Allen’s personal medical history; (7) Material Safety Data Sheets; (8) climatological data for Worcester for May and June 2001; (9) piping and mechanical plans for the Field House; and (10) Dr. Ratner’s expert report.

⁷ The Court notes that Ewing testified that OSHA regulations require that companies either take measurements at each time of applying the chemicals or have data from other standard applications. It is not clear whether defendant has this information or not; in any case, Ewing did not have it.

building and the conflicting recollections of the witnesses, Ewing concluded that it was not possible to predict with any degree of accuracy the amount of air that moved from the main gymnasium floor to the upper office where Allen was located during the resurfacing process. Accordingly, Ewing concluded that all the various models would over-estimate the concentration of solvents in the air.⁸

Because he found modeling methods unreliable in these circumstances, he turned to the next means of assessment: individual reports of exposure and symptoms. The ACGIH has established a threshold limit value (“TLV”) that sets the maximum concentration of chemicals in the air at which most workers will not suffer from any exposure-related effects; OSHA has its own measure, called the permissible exposure limit (“PEL”). Ewing also discussed the symptoms associated with the VOCs as outlined in the Material Safety Data Sheets (“MSDS”).⁹ Based on the reports of headaches, nausea, and dizziness experienced by Allen and his coworkers—symptoms consistent with overexposure to toluene and the other chemicals in the solvent mixture—Ewing found that significant concentrations of VOCs migrated to Allen’s office and other offices on his corridor.

It is not possible, Ewing found, to determine Allen’s exposure to the individual chemicals that made up the solvent mixture used to resurface the floor.¹⁰ As a consequence, it is not possible for him to conclude whether Allen’s exposure to any particular chemical exceeded the

⁸ Ewing testified that he evaluated a saturation model, a box model, and a multi-compartment model.

⁹ Material Data Safety Sheets are written or printed forms containing a list of the hazardous chemicals and their common names; physical and chemical properties; physical hazards; health hazards, including “signs and symptoms of exposure, and any medical conditions which are generally recognized as being aggravated by exposure to the chemical”; and any precautions for safe handling or clean up. 29 C.F.R. § 1910.1200(c), (g).

¹⁰ Besides toluene, the solvent mixture included ethyl benzene, xylene, ketones, and acetates.

PEL set by OSHA. Nonetheless, Ewing stated that, according to the standards of his field, when an individual is exposed to multiple chemicals that target the same systems in the human body, the industrial hygienist considers the exposure to the entire mixture of chemicals. Accordingly, based on the amounts of VOCs used during the resurfacing process, as well as Allen's and his co-worker's symptoms, Ewing concluded that Allen's exposure to the mixture of solvents known to act on the central nervous system approached or exceeded the TVL and the PEL for that mixture.

Defendant's first objection to Ewing's opinion is that it relies on the symptom accounts by Allen and his assistant coaches to determine the minimum amount of VOCs that reached the offices and caused those symptoms. Defendant offered the testimony of Dr. Hashimoto to establish that it is not reliable to use self-reports as the only basis of determining duration and amount. Citing other circuit law, defendant contends that anecdotal evidence is insufficiently reliable to allow expert testimony based on such evidence. *See In Re Paoli R.R. Yard PCB Litig.*, 35 F.3d 717 (3d Cir. 1994) (finding physician testimony based on self-reported symptoms unreliable where patients filled out check lists of symptoms as part of the preparation for the litigation); *Allison v. McGhan Med. Corp.*, 184 F.3d 1300 (11th Cir. 1999) (finding expert's reliance on case studies unreliable where conclusions flew in the face of numerous case-controlled epidemiological studies that concluded to the contrary). However, the circumstances under which those courts found the expert's methodology unreliable differ markedly from the circumstances here.

Ewing testified that he followed the standard practice of his industry in relying on the reported symptoms of Allen and others, after ruling out the use of other indicators. Defendant provides no arguments or evidence to undercut Ewing's testimony that he followed the

methodology standard in his field—specifically, that although it is preferable to use direct measurement to reach a conclusion on concentration and duration of exposure, reports of symptoms may be used as an alternative measure. *Cf. Bogosian*, 104 F.3d at 478 (upholding district court’s exclusion of expert testimony where no evidence was offered to show “that this is the way you find out that sort of thing”).

Moreover, Ewing did not rely alone on those symptom accounts in forming his opinion. He considered the amount of VOCs used in the resurfacing process, the information provided by the MSDS and OSHA about the toxicity of the VOCs, the manner in which the VOCs would dissipate in the environment in the building (including the weather at the time of application of the solvents), and the pathways of exposure—in addition to the reported affects—in arriving at his conclusion. Again, defendant provides no countervailing evidence that the methodology behind those conclusions is contrary to the standard practice in his industry or is generally considered suspect by other experts in his industry. The Court finds that defendant’s arguments are better directed to challenging the weight or credibility of Ewing’s opinion, not its admissibility. *Payton v. Abbott Labs*, 780 F.2d 147, 156 (1st Cir. 1985) (stating that the arguments that undercut some of the research basis of the expert’s opinion related to the evidence’s weight rather than its admissibility).

Defendant’s second objection to Ewing’s opinion is that it lacks specific measurements of the concentration of solvents or the duration of Allen’s exposure to those solvents.¹¹ It maintains

¹¹ Defendant also argues that Ewing’s testimony should be excluded because it was created exclusively for use in this litigation. *See* Fed. R. Evid. 702 Advisory Committee Note to 2000 Amendments. Of course, to some extent, every expert’s report is crafted specifically for use in litigation, yet not all are excluded. This factor comes into play in relatively blatant or extreme situations—where, for example, experts reverse earlier findings in order to craft a different conclusion, *Allison*, 184 F.3d at 1321 (stating that “such an about face in [the expert’s] opinion occurred because the opinion was developed in preparation for litigation”), or collect data with an eye towards

that Ewing cannot ascertain the amount or duration of Allen's exposure to toluene or any solvents in the mixtures with any degree of certainty. Without a precise measure, according to defendant, Ewing's conclusion that Allen was exposed to sufficient solvent mixture to cause neurological damage is merely guesswork, and should be excluded as both unreliable and unhelpful to the trier of fact.

Again, the Court finds that defendant's challenge to Ewing's conclusion goes to its weight rather than its admissibility. *Id.* Whether Allen was exposed to sufficient concentration of solvents to cause injury is a central issue in this matter; Ewing's expert testimony on the chemical properties of the solvent mixture, its volatility, and the amount of exposure will certainly assist the trier of fact in determining a fact in issue, as required under Rule 702.

Although the lack of specificity in Ewing's conclusion might well undercut his testimony in the eyes of the jury, the Court cannot conclude that it fails to meet the standards of Rule 702. *Cipollone*, 202 F.3d at 380 (stating that the ultimate standard for the admission of scientific evidence is "whether the testimony of the expert would be helpful to the jury in resolving a fact in issue"). Accordingly, the Court finds Ewing's methodology and analysis sufficiently sound to survive a Rule 702 challenge.

In summary, Ewing's testimony will not be excluded on the basis that it will not assist the trier of fact and relies upon unreliable methodology. Defendant's motion to exclude the testimony of Ewing will be denied.

C. Defendant's Challenge to Dr. Marcia Ratner's Testimony

maximum effectiveness in preparation for litigation, *In Re Paoli*, 35 F.3d at 762 (stating that physician reports for purposes of litigation are not suspect, however "a physician who evaluates a patient in preparation for litigation should seek more than a patient's self-report of symptoms or illness").

Dr. Marcia Ratner is a neurotoxicologist. Plaintiffs offer her testimony to establish both general causation (that is, toluene is capable of hastening the onset and progression of a motor degenerative disease like ALS) and specific causation (that is, Allen's exposure to toluene during the resurfacing project caused the early onset and progression of his disease). Defendant challenges her testimony based both on her qualifications as an expert in this matter and the reliability and relevancy of her opinion.

1. Qualifications

Dr. Ratner earned a Ph.D. from the Boston University School of Medicine's Behavioral Neurosciences Program in 2004. She has held various positions at the Boston University School of Medicine both prior to and since completing her degree. From 1998 to 2004, she worked as the Senior Toxicologist and Project Manager in the Department of Neurology's Environmental and Occupational Neurology Program. She trained under and worked collaboratively with Dr. Robert Feldman, M.D., a neurotoxicologist. After receiving her degree, she completed a three-year post-doctoral fellowship supported by a National Institutes of Health grant within the Department of Pharmacology and Experimental Therapeutics. In her work during the fellowship, she assessed the *in vivo* effects of novel chemicals with the goal of developing some into new drugs to address neurological and psychiatric disorders, including drugs for neurodegenerative diseases.¹²

Since 1998, Dr. Ratner has been a clinical research scientist in the Department of Neurology, where she evaluates patients with neurological conditions, including neurodegenerative diseases such as ALS. In this role, working collaboratively with Dr. Joseph

¹² "*In vivo*" refers to laboratory experiments conducted on living animals.

Jabre, a neurologist and faculty member at the School of Medicine, she has become knowledgeable and experienced in the diagnosis and treatment of patients with neurodegenerative disorders. Since 2004, she has also been a research associate in the Department of Pharmacology and Experimental Therapeutics. Through that work, she has gained knowledge and experience in biostatistics and epidemiology, as well as the ability to understand and apply the results of scientific studies to the consideration of causal assessment and to assess the quality of scientific studies.

Dr. Ratner has given lectures for the School of Medicine's Departments of Neurology, Biochemistry, and Environmental Health and its Behavioral Neuroscience Program. She has been an invited lecturer at the Harvard School of Public Health and the Massachusetts Neuropsychological Society, covering topics such as neurological disorders and neurotoxicology, introductory toxicology, and neurotoxicity. In addition, she has published numerous articles on neurotoxicology and related issues.

Defendant contends that Dr. Ratner lacks any expertise in ALS and, therefore, is not qualified to testify as an expert in this matter. Defendant again cites *Whiting* for the premise that an expert must be "qualified in the *specific* subject" in which she will testify. 891 F. Supp. at 24. While true to a considerable extent—obviously an expert must be qualified in the subject at hand, not some other subject—the issue is generally one of degree. The level of specialty "in the field in which [the expert] is giving [her] opinion affects not the admissibility of [her] opinion but the weight the jury may place on it." *Payton*, 780 F.2d at 155 (*quoted in Mitchell v. United States*, 141 F.3d 8 (1st Cir. 1998)). The Court does not find Dr. Ratner's testimony entirely lacking in relevance or reliability based on her more generalized background, even though "the generalized

nature of the proffered testimony may temper its probative value to the fact finder.” *Alzanki*, 54 F.3d at 1006.

Likewise, defendant’s argument that Dr. Ratner cannot testify that she has a reasonable degree of *medical* certainty because she is not a medical doctor places too heavy an emphasis on the “specialized knowledge” requirement of Rule 702. *See id.* Rule 702 allows a witness to be qualified as an expert based on her “knowledge, skill, experience, training, or education.” Although she may lack a medical degree, the record demonstrates that she has sufficient knowledge, skill, experience, and training to qualify her as an expert in this matter. Her lack of medical degree, and whatever other gaps may exist in her training and expertise, may be considered by the jury in evaluating the credibility of her conclusions.

2. Opinion

Dr. Ratner concluded that (1) the neurotoxic chemicals to which Allen was exposed are capable of altering or hastening the onset and course of a neurodegenerative disease such as ALS; and (2) Allen’s exposure to these chemicals was at least a substantial contributing factor in hastening the early onset and course of his ALS. Her first conclusion addresses the issue of general causation, and the second addresses specific causation.

a. General Causation

At the outset, Dr. Ratner discussed the methodology behind her conclusion that the chemicals in the solvent mixture are generally capable of hastening both the onset and progression of ALS. She began with a statement of the principles behind general causal inferences in science: general causation in science is a judgment based upon observations and experimental deductions, as well as upon an understanding of the general laws of nature. She started her inquiry into causal

inference by considering all available scientific evidence, from large epidemiologic case-control studies to small experimental studies, from anecdotal reports of events occurring in a few people to pharmacology, toxicology, and biologic plausibility theories and mechanisms of action.¹³ She contended that the fact that a study has flaws or is not statistically significant does not mean the study should be disregarded, because it would be inappropriate to fail to consider all of the available evidence cumulatively.

Dr. Ratner provided a detailed summary of the epidemiological studies relevant to her inquiry regarding the interaction between ALS and exposure to solvent compounds. For example, a 1997 study, conducted by McGuire *et al.*, reported a small but statistically significant increased risk of ALS in individuals who reported exposure to solvent compounds. After reviewing those studies, Dr. Ratner concluded that there was little epidemiological data on point for Allen's situation: there are few studies that examine specifically the relationship between age of onset of ALS in individuals and a preceding exposure event.¹⁴ However, she also concluded that there existed no epidemiological data that contraindicated a relationship between exposure to solvents and the hastening of ALS.

She then turned to the mechanisms by which ALS progresses. According to Dr. Ratner, although science does not know *what* causes ALS, science does understand *how* ALS occurs. Science understands the neuropathology and the mechanisms by which neurodegeneration occurs

¹³ "Biologic plausibility" is the combination of human and animal data that supports the mechanism by which disease is caused or damage is caused by some exposure.

¹⁴ Dr. Ratner observed that there were unlikely to be any such studies due to funding limitations, as most funding goes toward finding treatment or cures for the disease, not towards finding what accelerates the course of the disease.

in individuals with ALS. She discussed two mechanisms by which the progression of ALS occurs: glutamatergic excitotoxicity¹⁵ and oxidative stress.¹⁶ According to Dr. Ratner, glutamatergic excitotoxicity has a direct neurotoxic effect by causing the death of one or more neurons, whereas oxidative stress has an indirect effect by damaging the ability of neurons to function properly, which potentially can cause the release of excess glutamate or the death of the cell. The fact that science recognizes the effect of glutamatergic excitotoxicity on the progression of ALS is further evidenced by the United States Food and Drug Administration's approval of the compound riluzole for use in patients with ALS. Riluzole has been shown to slow the progression of ALS by inhibiting glutamatergic excitotoxicity, thus reducing the damage to motor neurons and, as a result, prolonging the survival period of ALS patients by several months. Dr. Ratner concluded that, if one compound can slow glutamatergic excitotoxicity, then another compound can accelerate it.

Next, Dr. Ratner described the mechanisms by which neurotoxic chemicals such as toluene cause neurodegeneration. She stated that the chemicals to which Allen was exposed, and in particular toluene, are known and generally accepted to be neurotoxicants—that is, they are toxic

¹⁵ “Glutamatergic excitotoxicity” is the process by which neurons die due to excess glutamate in the synaptic space between neurons. Glutamate is a chemical (called a neurotransmitter) released by neurons during communication with other neurons (called neurotransmission). When an upper motor neuron releases glutamate into the nerve space, the glutamate stimulates the lower motor neuron to release its neurotransmitter: the end result of this process is the signaling of a muscle cell to contract. Though glutamate is vital to neurotransmission, too much glutamate can result in excitotoxicity, a type of neuronal degeneration in which neurons die. As neurons die, they release their glutamate into the extracellular space, thus contributing to the excess of glutamate and the deaths of more neurons. ALS has been shown in experiments to progress in part by neuronal degeneration caused by glutamatergic excitotoxicity.

¹⁶ “Oxidative stress” results when the body cannot adequately rid itself of free radicals. Normally, antioxidants protect tissue by scavenging free radicals in the body; too many free radicals in the body can cause damage to the cell membranes of neurons or affect a neuron's ability to function properly. In addition, oxidative stress can result in a neuron's increased release of neurotransmitters, like glutamate. Oxidative stress has also been implicated in the progression of ALS.

to, and can kill, human neurons. She stated that the mechanism by which toluene acts as a neurotoxicant is generally accepted in the scientific community, and the mechanisms by which toluene acts upon neurons are identical to those by which neurodegeneration occurs in ALS: toluene is associated with both glutamatergic excitotoxicity and oxidative stress. Dr. Ratner contends that a review of the literature on toluene's effects and the MSDS for the chemicals used by defendant—as well as scientific logic—supports her conclusion that glutamatergic excitotoxicity and oxidative stress are two ways in which toluene is capable of altering or hastening the subclinical¹⁷ and clinical¹⁸ course of ALS because an additive effect results from the interaction of the toxic effects of toluene with the neuropathological mechanisms implicated in ALS.

Defendant challenges the admission of Dr. Ratner's opinion on general causation on the basis that it "rests on unverified assumptions, speculation and guesswork." *Polaino v. Bayer Corp.*, 122 F. Supp. 2d 63, 69 (D. Mass. 2000). It contends that her opinion is unreliable because her theory cannot be proved; because there are no peer-reviewed studies that support her theory; and because she is vague about the specific quantity of toluene and duration of exposure that would cause injury in a person. Ultimately, defendant contends that Dr. Ratner's opinion is not reliable and would not assist the trier of fact.

The Court disagrees. Most of defendant's criticisms of Dr. Ratner's testimony go to the weight and credibility of her opinion, not to its admissibility. *See Mitchell*, 141 F.3d at 10;

¹⁷ The "subclinical" course of a disease is the progression of a disease in a patient's body before it is detected or before symptoms are evident, in other words, before the disease is diagnosable.

¹⁸ The "clinical" course of a disease is the progression of a disease that can be measured in a clinical environment, such as a physician's office or hospital.

Payton, 780 F.2d at 156. Defendant may have highlighted substantial weaknesses in Dr. Ratner's conclusions, and a jury may find these weaknesses persuasive in assessing her credibility. But it has not provided evidence to show that her underlying scientific theories and methodology are inherently unreliable they must be excluded. Defendant's expert witness, Dr. Hashimoto, while disagreeing with her conclusions and the application of her conclusions to a specific case, did not testify as to any unsoundness in Dr. Ratner's data or methodology.

The one factor that defendant and its expert specifically identify—the lack of epidemiological evidence—does not tip the balance away from admissibility. As defendant rightly points out, there are no epidemiological studies to support Dr. Ratner's theory. On the other hand, as Dr. Ratner contends, there are no epidemiological studies that contradict any part of her theory. Furthermore, she testified that it is unlikely that any epidemiological studies will be conducted on this narrow subject, given the limited resources available for research into ALS and the priorities placed on finding a cause or a cure by the relevant communities. *See Daubert*, 509 U.S. at 593 (stating that some theories “are too particular, too new, or of too limited interest to be published”).

In her report and testimony, Dr. Ratner adequately explained what evidence does and does not exist in the scientific literature; she explained the known effects of toluene exposure on individuals; and she explained the clinical progression of ALS. Most significantly, she has provided a biologically plausible theory for linking the progression of ALS and exposure to toluene. *See Polaino v. Bayer Corp.*, 122 F. Supp. 2d 63, 70 (D. Mass. 2000) (stating that part of the standard protocol in reaching a conclusion about causation in cases involving toxic exposure is determining whether “the disease can be related to chemical exposure by a

biologically plausible theory) (quoting U.S. Federal Judicial Center, *Reference Manual on Scientific Evidence* 201 (1994)). Although Dr. Hashimoto disagreed with Dr. Ratner's ultimate conclusion that such evidence would be sufficient to establish general causation, he did not address any flaw in her methodology, other than the lack of epidemiological studies directly supporting her conclusion. The Court concludes that Dr. Ratner's expert testimony as to general causation is sufficiently reliable to survive scrutiny under Rule 702.

b. Specific Causation

Dr. Ratner further testified that just as there is an accepted method in assessing general causation, there is a generally accepted method to assess specific causation in neurotoxicity cases. According to her, this diagnostic algorithm, first published in 1999, has been generally accepted in the scientific and medical communities.¹⁹ First, when a patient presents with neurological symptoms, a clinician should perform a neurological, neurophysiological, and/or neuropsychological examination. If there is no objective evidence of neurological dysfunction, the clinician can conclude that there is no neurological disease. On the other hand, if the clinician does identify objective evidence of neurological dysfunction, the clinician should move onto a differential diagnosis.²⁰ This differential diagnosis would lead to either of two conclusions: (1) the neurological disease is of nontoxic etiology; or (2) a suspicion of neurotoxic etiology. In the latter case, the clinician would then ascertain via environmental, biochemical, and physiological

¹⁹ The algorithm was developed by Dr. Feldman and Dr. Ratner and presented by them in a paper published in the peer-reviewed professional series, *Neurologic Clinics*, in May 1999.

²⁰ Differential diagnosis is the methodology employed by physicians to rule out possible alternative causes of a patient's disease, in which the physician examines, among other factors, the patient's medical history, occupation, and habits. See *In Re Paoli*, 35 F.3d at 755; *Feliciano-Hill*, 439 F.3d at 25 (defining differential diagnosis as "a determination of which of two or more diseases, presenting with similar symptoms, has caused a patient's ailments").

markers whether the patient was exposed to any neurotoxins. Finally, after interpreting the data within a chronological context, the clinician may conclude that the patient's disease is a neurotoxic illness.

Dr. Ratner applied this method for assessing specific causation and arrived at several conclusions in this case. First, she emphasized that she is not of the opinion that exposure to solvent compounds *caused* Allen's ALS; she believes with a reasonable degree of scientific certainty that Allen was genetically predisposed to develop ALS and would have developed and died from ALS later in his life. That said, having determined that toluene is generally capable of hastening the early onset of ALS, Dr. Ratner examined the specific presentation of Allen's disease.

Allen and his coworkers reported symptoms consistent with exposures to chemicals at concentrations that were at least high enough to alter neuronal functioning. Dr. Ratner contends that Allen, therefore, was exposed to sufficient levels of toluene to succumb to its neurotoxic effects because he presented with neurologic symptoms—headache, dizziness, and nausea—close in time to his exposure. Furthermore, Allen developed symptoms of ALS in chronological relationship to this specific exposure event. Dr. Ratner also stated that, because Allen had no family history of ALS, he had ALS of the sporadic type, which generally has an average age of onset of sixty years of age. Because Allen's symptoms emerged when he was only forty-five years old, she stated that Allen developed the disease much earlier than would be expected based on his negative family history and the epidemiological findings.

Hence, Dr. Ratner contends that it can be concluded with a reasonable degree of medical certainty that Allen would have been unlikely to develop overt symptoms of ALS at 45 years of

age, and would not have died when he did, had he not been exposed to the solvent mixture used in the process of refinishing the Field House floor.

Defendant's arguments against admitting Dr. Ratner's opinion on specific causation reiterate most of the objections made to her opinion on general causation. It contends that her testimony is unreliable because (1) there are no epidemiological studies to support it; (2) she cannot provide an accurate assessment of Allen's actual exposure to toluene; and (3) her theory arises from assumptions, speculation, and guesswork. Defendant further contends that an assessment of Dr. Ratner's testimony under the *Daubert* factors cuts against admitting her testimony in every respect, including the fact that her theory was crafted with this litigation in mind.

The Court recognizes the novel nature of Dr. Ratner's theory linking toluene exposure to early onset and progression of ALS, as well as the fact that this theory arose from the facts in this matter. Certainly both facts cut against the reliability of her testimony. However, on balance, Dr. Ratner's testimony is sufficiently reliable to be admitted under Rule 702's standard. As the Court explained above, she provided a sufficient scientific basis for the grounds upon which her theory rests and the methodology for reaching her final conclusion. Again, besides an attack on her ultimate conclusion, defendant and its expert provide no evidence that her underlying reasoning and methodology are scientifically unsound.²¹

Moreover, the lack of a specific measurement of Allen's exposure to the solvent mixture

²¹ Defendant additionally contends that Dr. Ratner's theory cannot be disproved. *See Daubert*, 509 U.S. at 593-94 (stating that courts should consider whether a scientific theory can be tested). Without any testimony on this point, it is unclear to the Court why defendant finds *in vivo* and *in vitro* experiments incapable of being replicated, since there is no evidence that she did not follow the standard techniques and methodology of her field in conducting her experiments.

was addressed in Ewing's opinion. A jury might well find this fact a fatal flaw in Dr. Ratner's opinion; nonetheless, there is not a sufficient basis to exclude it altogether. Again, the Court reiterates that most of defendant's arguments go to the weight of the testimony, not to its admissibility. *Freeman v. Package Mach. Co.*, 865 F.2d 1331, 1338 (1st Cir. 1988). Thus, the Court concludes that Dr. Ratner's testimony satisfies the requirements of Rule 702 and that her testimony will not be excluded.

D. Defendant's Challenge to Dr. Christine Oliver's Testimony

Dr. Oliver is a physician specializing in occupational medicine. Plaintiffs offer Dr. Oliver's testimony to establish that Allen died from ALS and that the early onset and rate of progression of the disease were causally related to his exposure to the solvent mixture used in installing the gym floor. Defendant challenges the admissibility of her testimony on multiple grounds. First, it contends that she lacks the qualifications to give expert testimony in this matter. Second, it also contends that her medical opinions fail to meet the Rule 702 standards for reliability and relevancy. Finally, defendant challenges her opinion that defendant was negligent in its failure to adequately warn of the toxicity of the solvent mixture, both on the basis of her qualifications to offer such an opinion and the admissibility of such testimony.

1. Qualifications

Dr. Christine Oliver earned a medical degree from the University of North Carolina School of Medicine in 1970. She subsequently obtained master's degrees in public health and in science, in 1978 and 1979 respectively. She is licensed to practice medicine in Massachusetts, New York, and North Carolina, and is board-certified in internal medicine and in preventive medicine, a subspecialty of occupational medicine. She also has a clinical practice at the Massachusetts

General Hospital ("MGH") in occupational and environmental medicine. Her appointment is in the pulmonary and critical care unit. She currently has an appointment as an assistant clinical professor of medicine at Harvard Medical School. She is the founder and president of Occupational Health Initiatives, a consulting firm.

From 1979 to 1981, Dr. Oliver worked as an occupational physician on the medical staff for the Oil, Chemical, and Atomic Workers' International Union. From 1980 to 1990, she worked at MGH as co-director of occupational medicine and from 1990 to 1996, as director of occupational and environmental medicine. From 1992 to 1998, she worked as a medical consultant to the Commissioner of the Massachusetts Department of Industrial Accidents; in that capacity, she advised on the implementation of the medical provisions of an act reforming Massachusetts' workers' compensation laws. She has served as secretary of the Council for Occupational Health for the National Association for Public Policy from 1982 to 1983 and as a member of the editorial board for *Applied Occupational and Environmental Hygiene* in 1995.

Dr. Oliver has also served on planning committees for the Hazardous Waste Surveillance Program for the National Institute of Occupational Safety and Health, as well as for the International Congress on the Health Effects of Hazardous Wastes. She has conducted research and published extensively on the subject of occupational medicine, with a focus primarily in the area of occupational lung disease. She has been a peer reviewer for *The American Journal of Industrial Medicine*, *Applied Occupational and Industrial Hygiene*, and *Mount Sinai School of Medicine Journal*. She has presented to the American Public Health Association on the methodology of epidemiologic studies. She has also consulted previously on cases involving individuals with solvent exposure.

Defendant contends that Dr. Oliver lacks specific expertise in ALS and is therefore not qualified to testify as an expert in this matter. Again, the Court does not agree that Rule 702 need be read so narrowly, as long as the expert is qualified by “knowledge, skill, experience, training, or education” to render the opinion at issue. Fed. R. Evid. 702. *See Mitchell*, 141 F.3d at 15 (finding an expert qualified to testify in an area outside his specialty but within his area of expertise); *Diefenbach v. Sheridan Transp.*, 229 F.3d 27, 31 (1st Cir. 2000) (finding docking expert “well-qualified” to testify though he had never crewed on the specific type of vessel at issue). Dr. Oliver’s credentials as a physician are unchallenged by defendant. Its challenge as to her lack of specialization in the area of ALS is a fact that “affects not the admissibility of [her] opinion but the weight the jury may place on it.” *Payton*, 780 F.2d at 155; *Mitchell*, 141 F.3d at 15.

2. Medical Opinion

Dr. Oliver’s expert report and her testimony delineated two primary medical conclusions. First, she concluded that Allen had sporadic ALS and died as a result of his disease.²² Second, she concluded that the time of onset and rate of progression of ALS in Allen’s case were causally related to his exposure to solvent vapors and aerosols during the resurfacing of the Field House floor.²³

²² Dr. Oliver’s conclusions that Allen had ALS and that his cause of death was due to this disease were based on the diagnosis Allen received from his treating physicians in January and February 2002, his medical records, and the death certificate. She determined that Allen’s symptoms were consistent with his suffering from ALS. As support for her conclusion that Allen had sporadic, rather than familial, ALS, she stated that Allen had no family history of ALS. As familial ALS is inherited as an autosomal dominant trait, she concluded that the absence of family history makes familial ALS highly unlikely.

²³ Dr. Oliver considered the following information in the course of rendering her opinion: (1) Allen’s medical records from October 1993 to May 2004; (2) exposure information provided by defendant in interrogatory answers; (3) Material Safety Data Sheets; (4) affidavits from Allen’s coworkers and an applicator of the floor

Dr. Oliver testified that two “cornerstones” in occupational medicine of diagnosing exposure-related disease are: (1) the consistency of the patient’s symptoms and clinical manifestations with what a physician would expect to occur in association with a given exposure and of the temporal relationship between the onset or worsening of symptoms and that exposure; and (2) the use of differential diagnosis to exclude other possible causes. Thus, she began with Allen’s exposure to solvents in the Field House project in May and June 2001.

Dr. Oliver found that the symptoms that Allen and his colleagues developed during this time period are consistent with the neurotoxic effects of toluene—namely, headache, dizziness, nausea, and disorientation. Because these symptoms are associated with exposure to toluene at 600 parts per million over an eight-hour period, Dr. Oliver concluded that Allen’s exposure to toluene must have exceeded the PEL set by OSHA of 200 parts per million. She then concluded that the nature of Allen’s symptoms, as well as the distinct temporal relationship between their onset and persistence and the resurfacing of the floor, were consistent with, and make likely, a causal association.

Next, Dr. Oliver applied differential diagnosis to the review of Allen’s medical records, the deposition testimony of Allen’s spouse, and the affidavits of co-workers who knew Allen well. Those documents revealed that Allen was active and healthy prior to his exposures in the early summer of 2001. There is no family history of ALS, so he did not have familial ALS. Dr. Oliver stated that other putative causes of ALS include exposure to pesticides and agricultural chemicals

installed in the Field House; (5) a technician’s manual; (6) expert reports from Dr. Ratner and William Ewing; (7) a walk-through inspection conducted in May 2007; and (8) published medical and scientific literature.

containing solvents, 60-hertz magnetic fields, and welding fumes.²⁴ However, she found no evidence that Allen was exposed materially to these agents. Thus, she concluded that differential diagnosis revealed no other causes of the early onset and hastened progression of Allen's ALS.

Dr. Oliver concluded that Dr. Ratner's report provides ample evidence of the motor neuron toxicity of solvents generally and of toluene specifically. She also concluded that the epidemiologic evidence also supports a causal connection between exposure to solvents and the development of ALS.²⁵ After reviewing the available literature, Dr. Oliver concluded that *in vitro* data from toxicological studies, *in vivo* data from animal studies, and epidemiologic data from studies in human populations in a number of different countries all support a causal association between solvent exposure and the development and/or exacerbation of motor neuron disease in

²⁴ Again, although Dr. Oliver's testimony in this regard touches on the causes of ALS, plaintiffs do not contend that exposure to toluene caused Allen's ALS, but only that it hastened the disease's onset and progression.

²⁵ Because a large part of defendant's argument rests on a different interpretation of the epidemiological evidence, the Court will briefly summarize the epidemiological studies referenced by Dr. Oliver in her report and testimony. For full citations for the studies, see Pl. Mem. Tab 4 at 14.

The Hawkes study raised the question of a causal relationship between motor neuron degeneration and exposure to solvents. The Chio *et al.* letter to the editor presented data on the occurrence of MND among various trade workers exposed to solvents and found odds ratios greater than one, even though the small number of workers examined meant there was no statistical significance. The Chancellor *et al.* case study of patients with MND in Scotland observed an odds ratio of 3.3 for exposure to solvents. The Mitchell *et al.* case-controlled study in England examining risk factors for MND found a relative risk of 2.46 associated with exposure to fumes and dust. The McGuire *et al.* study found, in a population of men newly diagnosed with ALS, an odds ratio of 2.6 with exposure to alcohols and ketones and an odds ratio of 1.9 with exposure to cleaning solvents. The Park *et al.* study found an elevated mortality odds ratio for MND with occupational exposures to solvents. The Morahan *et al.* case-controlled study in Australia observed a 1.85 odds ratio in ALS patients who had occupational exposure to solvents. The Chio *et al.* prospective-based study examining the predictive value of age at onset and symptom progression in patients with ALS found that older age at onset was associated with more rapid progression.

Odds ratios apply to case-controlled studies. According to the testimony of Dr. Clapp, the term "odds ratio" refers to the odds of exposure in the cases compared to the odds of exposure in the controls: thus, it is an estimate of the excess or decreased risk in the case-controlled study. The term "relative risk," which is used in reference to all epidemiological studies, represents the incidence of disease in the exposed group divided by the incidence of disease in the unexposed group. The expert testimony is in conflict as to how high an odds ratio or relative risk had to be in order to be considered relevant to the inquiry here.

the form of sporadic ALS.

Defendant contends that Dr. Oliver's testimony should be excluded as both unreliable and unhelpful to the trier of fact under Fed. R. Evid. 702. First, it contends that her theory that there is a connection between toluene and the hastening of ALS, both in onset and progression, is not scientifically supported. Among other things, defendant challenges her reliance on Dr. Ratner's opinion and a lack of general acceptance in the medical community for her conclusion. Defendant specifically challenges her assessment of the epidemiological evidence regarding any connection between exposure to solvents and ALS.²⁶ Second, it contends that she lacks sufficient knowledge to support her ultimate conclusion because she cannot show the duration or concentration of Allen's exposure and failed to account for other potential causes of Allen's condition. Third, it challenges the adequacy of her differential diagnosis, specifically, that it failed to adequately account for other potential causes of Allen's early-onset ALS. Finally, defendant contends that the reliability of her opinion is additionally undermined by the fact that her opinion was created for the purposes of this litigation.

Again, the Court concludes that many of defendant's contentions go to the weight of the testimony, not to its admissibility. As the Court has already found Dr. Ratner's testimony consistent with the requirements of Rule 702, Dr. Oliver's reliance on that opinion is sufficiently reliable to meet the requirements of the rule as well. *See Ferrara & DiMercurio v. St. Paul Mercury Ins. Co.*, 240 F.3d 1, 9 (1st Cir. 2001) (stating that one expert's reliance on another's

²⁶ Dr. Ratner and Dr. Oliver rely on the same group of epidemiological studies and *in vivo* studies. However, defendant's challenge to this evidence during the *Daubert* hearing centered more on Dr. Oliver's assessment. Accordingly, the Court addresses defendant's contentions here, although some of the arguments apply equally to Dr. Ratner's opinion.

opinion “goes to the weight, not to the admissibility of the expert’s opinion”). The lack of a precise measurement of the duration or concentration of Allen’s exposure to solvents may substantially undermine the persuasiveness of the opinion. However, the conclusion arrived at via Dr. Oliver’s methodology—that Allen was exposed to sufficient concentrations of solvent to accelerate the time of onset and rate of progression of his ALS— is not so inherently unreliable that exclusion is required.

In support of its contention that Dr. Oliver’s assessment of the epidemiological evidence was faulty, defendant offered the opinion and testimony of its expert, Dr. Dean Hashimoto. He testified that the consensus in the medical community is that there is no known causal association between exposure to solvents and the initiation and progression of ALS. He also stated that while the literature shows statistical associations, it does not support conclusions about actual causes. His review of the studies revealed that some show a statistical association and some do not (although the Court notes that Dr. Hashimoto and Dr. Oliver appear to have mostly reviewed different studies). Dr. Hashimoto testified that the studies upon which Dr. Oliver relied examine low-dose exposures over a length of time, not a high-dose exposure over a short period; accordingly, the studies she relied on are not relevant. In addition, the studies’ reports of relative ratios are not statistically significant in most of the papers relied on by Dr. Oliver.

It is not the role of the Court to determine whether Dr. Hashimoto’s or Dr. Oliver’s testimony regarding the strength of the epidemiological studies on any link between exposure to solvents or toluene and ALS is more persuasive. “*Daubert* neither requires nor empowers trial courts to determine which of several competing scientific theories has the best provenance. It demands only that the proponent of the evidence show that the expert’s conclusion has been

arrived at in a scientifically sound and methodologically reliable fashion.” *Ruiz-Troche*, 161 F.3d at 85. The competing positions are better “tested by the adversarial process . . . rather than excluded from juror’s scrutiny for fear that they will not grasp its complexities or satisfactorily weigh its inadequacies.” *Id.*; see also *Pipitone v. Biomatrix, Inc.*, 288 F.3d 239, 246 (5th Cir. 2002) (stating, in case alleging that injection into knee of product to replace synovial fluid caused plaintiff to be infected with salmonella, that the lack of evidence in the literature of salmonella infections arising from injectable knee product “does not undermine [expert’s] hypothesis”); Fed. R. Evid. 702 Advisory Committee Note to 2000 Amendments (stating that “[t]he amendment is broad enough to permit testimony that is the product of competing principles or methods in the same field of expertise”).

Finally, defendant challenges Dr. Oliver’s differential diagnosis and her conclusion that Allen’s exposure to toluene hastened the onset of his ALS. Dr. Hashimoto testified that it would be crucial to know the duration and amount of exposure in order to determine cause of onset and progression of ALS. He also stated that Allen’s symptoms were not neurotoxic, but non-specific symptoms most often associated with mucus membrane irritation. These factors, coupled with his opinion regarding the epidemiological studies, led Dr. Hashimoto to the opinion that there was no basis for Dr. Oliver’s conclusions. Once again, the Court finds Dr. Hashimoto’s testimony relevant to challenging the weight of Dr. Oliver’s opinion, not its admissibility. Differential diagnosis is “a standard medical technique.” *Baker v. Dalkon Shield Claimants Trust*, 156 F.3d 248, 253 (1st Cir. 1998); *Int’l Adhesive Coating Co. v. Bolton Emerson Int’l, Inc.*, 851 F.2d 540, 544-45 (1st Cir. 1988) (“When the factual underpinning of an expert’s opinion is weak, it is a matter affecting the weight and credibility of the testimony- a question to be resolved by the

jury.”). Dr. Hashimoto’s testimony does not challenge Dr. Oliver’s methodology, so much as the strength one can place on the conclusion she reached.

Accordingly, the Court concludes that Dr. Oliver’s testimony as to medical issues is both sufficiently reliable and relevant to meet the requirements of Rule 702. The Court will admit her opinion testimony regarding Allen’s ALS and whether toluene hastened its onset or progression.

3. Failure to Warn Opinion

Dr. Oliver also opines that defendant was negligent in failing to warn Allen of the toxicity of the chemical used in resurfacing the gym floor, as well as negligent in failing to ensure the adequate protection of the employees working in the Field House. Defendant contends that Dr. Oliver’s opinion is inadmissible because it invades the province of the jury.²⁷ “Generally, an expert may not offer an opinion concerning a legal question.” *Levin v. Dalva Bros.*, 459 F.3d 68, 79 (1st Cir. 2006).

Plaintiffs respond that testimony about industry practices is both relevant and appropriate. “Expert testimony on industry standards is common fare in civil litigation.” *Id.* The Court will allow Dr. Oliver to testify as to industry standards but will exclude any testimony that specifically states that the defendant is negligent. That ultimate conclusion will be left to the jury to decide.

III. Conclusion

For the foregoing reasons, the Court grants plaintiffs’ motion and denies defendant’s motions, except for defendant’s motion to exclude Dr. Oliver’s failure to warn testimony, which

²⁷ Defendant also contends that Dr. Oliver is not qualified as a legal expert to offer that opinion. At least insofar as her competence to testify about appropriate industry standards, the Court disagrees. The Court recognizes that Dr. Oliver has more than 20 years of experience as an occupational physician and has experience in education and prevention as part of her practice. According to plaintiffs, Dr. Oliver has read and interpreted thousands of Material Safety Data Sheets for toxic chemicals and has worked with both labor and management to make sure that workers and bystanders are protected from exposure to such chemicals in the workplace.

the Court grants in part.

So Ordered.

/s/ F. Dennis Saylor
F. Dennis Saylor IV
United States District Judge

Dated: September 24, 2008