IN THE UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF PENNSYLVANIA

Hartle et al., Plaintiffs, v. FirstEnergy Generation Corp., Defendant.	Civil Action No. 08-1019

MEMORANDUM OPINION

CONTI, Chief District Judge

I. Introduction

Before the court are expert challenges filed by plaintiffs Michael and Jessica Hartle and their minor daughter, "GH" (collectively "plaintiffs"), and defendant FirstEnergy Generation Corporation ("FirstEnergy" or "defendant"). This case involves FirstEnergy's Bruce Mansfield Power Plant ("Bruce Mansfield"), a coal-fired electric generating facility located along the Ohio River in Shippingport, Pennsylvania. The plaintiffs allege that on July 22, 2006, Bruce Mansfield discharged air pollution in the form of "black rain," a dark-colored sooty material that fell to the ground near the plant. The plaintiffs allege that GH was playing outside during the black rain event and was exposed to toxins—particularly thallium, arsenic, and other hazardous metals—in the sooty residue, which caused her to suffer alopecia[1] and other adverse health effects.

The parties conducted extensive fact and expert discovery in this case and two other cases consolidated for discovery purposes (*Patrick v. FirstEnergy Generation Corp.*, Civil No. 08-1025, and *Price v. FirstEnergy Generation Corp.*, Civil No. 08-

1 Alopecia is a medical condition involving hair loss. In this case, GH became completely bald, a condition known as alopecia totalis. (Gehris Dep. 23:23–25:1, June 19, 2009, ECF No. 108-15.)

1030). This memorandum opinion addresses the parties' motions to exclude the expert testimony of Michael Gochfeld, MD ("Gochfeld"), ECF No. 106; Peter Valberg, PhD ("Valberg"), ECF No. 120; James S. Smith, PhD ("Smith"),[2] ECF No. 102; and Allister Vale, PhD ("Vale"), ECF No. 122. These experts opine on toxicology and medical issues related to the causation of GH's medical conditions. The motions to exclude these experts are fully briefed, and the court heard testimony and argument on October 16, 2013.

II. Legal Standards

Federal Rule of Evidence 702 governs the admissibility of expert testimony and states:

> A witness who is qualified as an expert by knowledge, skill, experience, training, or education may testify in the form of an opinion or otherwise if:
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> (a) the expert's scientific, technical, or other specialized knowledge will help the trier of fact to understand the evidence or to determine a fact in issue;
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> (b) the testimony is based on sufficient facts or data;
>
> (c) the testimony is the product of reliable principles and methods; and
>
> (d) the expert has reliably applied the principles and methods to the facts of the case.

FED. R. EVID. 702. Under the seminal case of *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579 (1993), district courts must act as gatekeepers to "ensure that any and all scientific testimony or evidence admitted is … reliable."[3] *Id.* at

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2 Smith also rendered opinions, challenged by defendant, in the *Patrick* and *Price* cases. These motions are not at issue in the present memorandum opinion.

3 While *Daubert* applied exclusively to scientific testimony, *see Daubert*, 509 U.S. at 590 n.8, the Supreme Court subsequently extended the district court's gatekeeper function to all expert testimony. *Kuhmo Tire Co. v. Carmichael*, 526 U.S. 137, 147 (1999).

589. The United States Court of Appeals for the Third Circuit explained that Rule 702 "embodies a trilogy of restrictions" that expert testimony must meet for admissibility: qualification, reliability and fit. *Schneider ex rel. Estate of Schneider v. Fried,* 320 F.3d 396, 404 (3d Cir. 2003). The party offering the expert testimony has the burden of establishing each of these requirements by a preponderance of the evidence. *In re TMI Litig.,* 193 F.3d 613, 663 (3d Cir. 1999).

A. Qualification

An expert witness's qualification stems from his or her "knowledge, skill, experience, training, or education." FED. R. EVID. 702. The witness therefore must have "specialized expertise." *Schneider*, 320 F.3d at 405. The court of appeals interprets the qualification requirement "'liberally,' holding that 'a broad range of knowledge, skills, and training qualify an expert as such.'" *Calhoun v. Yamaha Motor Corp., U.S.A.*, 350 F.3d 316, 321 (3d Cir. 2003) (quoting *In re Paoli R.R. Yard PCB Litig.*, 35 F.3d 717, 741 (3d Cir. 1994)). When evaluating an expert's qualifications, district courts should not insist on a certain kind of degree or background. *Robinson v. Hartzell Propeller Inc.*, 326 F. Supp. 2d 631, 667 (E.D. Pa. 2004). An expert's qualifications are determined with respect to each matter addressed in the proposed testimony. *Calhoun*, 350 F.3d at 322 ("An expert may be generally qualified but may lack qualifications to testify outside his area of expertise."). "While the background, education, and training may provide an expert with general knowledge to testify about general matters, more specific knowledge is required to support more specific opinions." *Id.*

B. Reliability

In *Daubert*, the Supreme Court stated that the district court's gatekeeper role requires "a preliminary assessment of whether the reasoning or methodology underlying the testimony is … valid and of whether the reasoning or methodology properly can be applied to the facts in issue." *Daubert*, 509 U.S. at 592–93. While the Court noted in *Daubert* that district courts were permitted to undertake a flexible

inquiry into the admissibility of expert testimony under Rule 702, the court of appeals has enumerated the following eight factors that a district court may examine:

1. whether a method consists of a testable hypothesis;
2. whether the method has been subjected to peer review;
3. the known or potential rate of error;
4. the existence and maintenance of standards controlling the technique's operation;
5. whether the method is generally accepted;
6. the relationship of the technique to methods which have been established to be reliable;
7. the qualifications of the expert witness testifying based on the methodology; and
8. the non-judicial uses to which the method has been put.

In re Paoli R.R Yard PCB Litigation , 35 F.3d 717, 742 n.8 (3d Cir. 1994) ("*Paoli II*"). This list of factors is a "convenient starting point," but is "neither exhaustive nor applicable in every case." *Kannankeril v. Terminix Int'l, Inc.*, 128 F.3d 802, 806–07 (3d Cir. 1997).

Under these factors, experts are not permitted to engage in a "haphazard, intuitive inquiry," but must explain the research and methodology they employed in sufficient detail in order to allow the other party's expert to test that hypothesis. *Oddi v. Ford Motor Co.*, 234 F.3d 136, 156 (3d Cir. 2000). Where an expert fails to use standards to control his or her analysis, "no 'gatekeeper' can assess the relationship of [the expert's] method to other methods known to be reliable and the non-judicial uses to which it has been put." *Id.* at 158.

"The evidentiary requirement of reliability is lower than the merits standard of correctness." *Paoli II,* 35 F.3d at 744. "As long as an expert's scientific testimony rests upon 'good grounds, based on what is known,' it should be tested by the adversary process—competing expert testimony and active cross-examination—rather than excluded from jurors' scrutiny for fear that they will not grasp its complexities or

satisfactorily weigh its inadequacies." *United States v. Mitchell*, 365 F.3d 215, 244 (3d Cir. 2004) (quoting *Ruiz-Troche v. Pepsi Cola of P.R. Bottling Co.*, 161 F.3d 77, 85 (1st Cir. 1998)).

C. Fit

The Rule 702 requirement that testimony "help the trier of fact to understand the evidence or to determine a fact in issue" is called the "fit" requirement. Fit requires that there be a "connection between the scientific research or test result to be presented and particular disputed factual issues in the case." *Paoli II*, 35 F.3d at 743. "'[I]t is not always obvious, and scientific validity for one purpose is not necessarily scientific validity for other, unrelated purposes.'" *Id.* (quoting *Daubert*, 509 U.S. at 591). The standard for fit is "not that high," although it is "higher than bare relevance." *Id.* at 745.

III. Discussion

A. Defendant's Motion to Preclude the Expert Opinions of Gochfeld

Plaintiffs' expert Gochfeld is a physician. He examined GH in 2008 and concluded that her hair loss was caused by exposure to thallium and arsenic. In 2012, Gochfeld reviewed his file and additional documents that became available after the original examination and prepared an expert report dated July 12, 2012 ("Gochfeld Rep."). Gochfeld opined that "chemical exposure from soot, including thallium and arsenic, were responsible for [GH's] alopecia." (Gochfeld Rep. 2, ECF No. 108-1.) Gochfeld submitted a rebuttal report dated December 3, 2012 ("Gochfeld Rebuttal Rep."), addressing the reports submitted by other experts.

Defendant challenges the reliability of Gochfeld's opinions on three grounds: (1) Gochfeld failed to determine the level of thallium exposure needed to cause alopecia and the dose received by GH; (2) Gochfeld failed to rule out alopecia areata, an autoimmune condition, as the cause of GH's hair loss and failed to account for

conditions inconsistent with thallium poisoning; and (3) Gochfeld solely relied upon the temporal relationship between GH's exposure and the hair loss.

1. No Calculation of Dose of Thallium Received by GH

Defendant argues that a determination of dose received is a requirement for proving causation in a toxic-tort case. (ECF No. 107, at 8 (citing *McClain v. Metabolife Int'l, Inc.*, 401 F.3d 1233, 1241 (11th Cir. 2005).) Gochfeld admitted that he did not calculate the dose of thallium received by GH and could not do so based on "the very meager information available." (Gochfeld Dep. 146:18–147:1, Feb. 19, 2013, ECF No. 108-5.) Gochfeld did not offer an opinion about the threshold dose of thallium required to cause alopecia in humans. (ECF No. 148, at 10.) Plaintiffs respond that there is no requirement that a plaintiff present evidence of the precise dose received in every case. (*Id.* at 9.) For example, plaintiffs point out, where concentrated pool chemicals spilled on to a plaintiff's face, the inability of the medical expert to identify the specific dose did not render his opinion unreliable. *Best v. Lowe's Home Ctrs., Inc.*, 563 F.3d 171, 178 (6th Cir. 2009).

This case is not as obvious as chemicals spilled on a face. Nevertheless, Gochfeld's failure to identify a precise thallium exposure does not render his opinions inadmissibly unreliable. In *Kannankeril v. Terminix International, Inc.*, 128 F.3d 802 (3d Cir. 1997), the district court excluded the plaintiffs' medical expert for failing to determine the plaintiffs' exact degree of exposure to pesticide. *Id.* at 808. The Court of Appeals for the Third Circuit reversed, finding that the expert had sufficient knowledge of exposure from his review of the defendant's pesticide application records and holding that "all factual evidence of the presence of the chemicals in the residence should be relevant in forming an expert opinion of causation." *Id.* at 808–09. The expert's lack of direct test results for the dose received was a matter for the trier of fact to weigh in determining the expert's credibility. *Id.* at 809 (admonishing

trial judges to "be careful not to mistake credibility questions for admissibility questions").

Gochfeld performed a "differential diagnosis," a technique that involves ruling out alternative causes for symptoms "by a systematic comparison and contrasting of the clinical findings." *Id.* at 807 (internal quotation marks omitted). Differential diagnosis involves "the testing of a falsifiable hypothesis[,] … has widespread acceptance in the medical community, has been subject to peer review, and does not frequently lead to incorrect results." *Paoli II*, 35 F.3d at 758.

Gochfeld heavily relied on the timing of the hair loss relative to the alleged thallium exposure. In certain circumstances, "the reporting of symptoms can be in itself diagnostic of exposure to a specific substance, particularly in evaluating acute effects." Bernard D. Goldstein & Mary Sue Henifin, *Reference Guide on Toxicology*, *in* Reference Manual on Scientific Evidence 633, 671 (3d ed. 2011). Alopecia is a strong indication of thallium exposure. Defendant's expert Vale testified that "alopecia develops in virtually everyone who is poisoned with thallium." (Vale Dep. 115:17–18, Apr. 19, 2013, ECF No. 148-9.) Gochfeld found that GH's hair loss began two or three weeks after the black rain event. (Gochfeld Rep. 2, ECF No. 108-1.) In light of the strong temporal connection between exposure and symptoms and Gochfeld's differential diagnosis ruling out alternative causes, his inability to calculate a thallium dose for GH does not render his diagnosis inadmissibly unreliable.

2. Failure to Exclude an Autoimmune Cause for the Hair Loss and Account for Conditions Inconsistent with Thallium Poisoning

Defendant argues that Gochfeld failed to consider the conclusions of other physicians who treated or examined GH. (ECF No. 107, at 10.) Dr. Michael Speca, Dr. Robert Stiegel, Dr. Matthew Zirwas, and Dr. Robin Gehris each diagnosed GH with alopecia areata, an autoimmune condition. Defendant argues that Gochfeld did not adequately respond to this alternative hypothesis, making his differential diagnosis scientifically unreliable. (*Id.* at 11.) Although "[a] medical expert's causation conclusion

should not be excluded because he or she has failed to rule out every possible alternative cause of a plaintiff's illness," the expert must rule out plausible alternative causes. *Heller v. Shaw Indus., Inc.*, 167 F.3d 146, 156 (3d Cir. 1999).

Gochfeld noted that an autoimmune condition is a plausible cause for GH's hair loss, but he adequately considered it and ruled it out. (Gochfeld Rebuttal Rep. 5, ECF No. 108-18.) Gochfeld cited a peer reviewed study indicating that alopecia areata is rare before age three (GH was thirty-four months old at the onset of the hair loss). (*Id.*) Tests found that GH had no biomarkers for an autoimmune condition. (*Id.* at 8.) These factors, combined with the onset of symptoms at the time consistent with a toxic cause, led Gochfeld to rule out an autoimmune basis. (*Id.*) The disagreement of other experts is a matter for the jury to resolve. Gochfeld's opinion will not be excluded on this basis.

Defendant argues that, aside from hair loss, GH did not experience symptoms of thallium poisoning, which typically include severe abdominal pain, vomiting, nausea, bloody diarrhea, and discolored lines on the nails of fingers and toes. (ECF No. 107, at 14; *see* Gochfeld Dep. 59:10–61:14, ECF No. 108-5.) Additionally, defendant argues that GH's pattern of hair regrowth—starting two years after it was first lost and not completely regrown for five or six years—was inconsistent with a diagnosis of thallium poisoning. (ECF No. 107, at 15–16.) Plaintiffs point to evidence that GH's hair began regrowing a year and a half after the alleged exposure, which is consistent with thallium toxicity. (ECF No. 148, at 16; Gochfeld Rep. 2, ECF No. 108-1.) This disputed fact is for the jury to resolve. The lack of additional symptoms is a matter of weight, not admissibility.

3. Reliance on the Temporal Relationship Between Exposure and Symptoms

Defendant argues that Gochfeld's opinion is unreliable because it relies solely on the temporal relationship between the alleged exposure and GH's hair loss. (ECF No. 107, at 16.) This argument is supported by case law. *See Buzzerd v. Flagship Carwash*

of Port St. Lucie, Inc., 669 F. Supp. 2d 514, 530 (M.D. Pa. 2009) (excluding an opinion that rested "almost exclusively on the temporal connection" between plaintiffs' reported symptoms and alleged exposure); *Roche v. Lincoln Prop. Co.*, 278 F. Supp. 2d 744, 764 (E.D. Va. 2003) ("An opinion based primarily, if not solely, on temporal proximity does not meet *Daubert* standards.").

In *Heller*, the Court of Appeals for the Third Circuit affirmed the exclusion of a causation opinion "largely" based upon the temporal relationship between the plaintiff's illness and the installation of defendant's product. *Heller*, 167 F.3d at 157–58. The court of appeals noted that a stronger temporal link could support a conclusion of causation. *Id.* at 158 ("[W]hen the temporal relationship is strong and is part of a standard differential diagnosis, it would fulfill many of the *Daubert*/*Paoli* factors."). In this case, the link between thallium toxicity and hair loss is strong, the temporal proximity between symptoms and the alleged exposure supports the diagnosis, and other causes have been ruled out as part of a differential diagnosis. Gochfeld's opinions meet the standard for admissibility. Defendant's motion to preclude Gochfeld's opinions will be denied.

B. Plaintiffs' Motion to Limit the Testimony of Valberg

Valberg, a toxicologist, submitted an expert report dated October 22, 2012 ("Valberg Rep."). Valberg calculated GH's potential exposure to thallium based upon the parties' air dispersion models and a chemical analysis of the black rain residue. Based upon information that GH engaged in pica behavior—the eating of nonfood substances such as dirt—Valberg applied the analysis of a U.S. Environmental Protection Agency report entitled "World Trade Center Indoor Environment Assessment" ("WTC Assessment"). (Valberg Rep. 6, ECF No. 121-2.) The WTC Assessment contains input parameters for pica activity, which Valberg conservatively applied. (*Id.* at 7.) Valberg calculated GH's "reasonable maximum dose" of thallium to be 0.00057 mg (or 0.000044 mg/kg). (*Id.* at 14.) Valberg compared this to the lowest

recorded dose of thallium known to cause alopecia, 310 mg or 4.4 mg/kg, which is approximately 100,000 times larger than GH's maximum dose. (*Id.*) Valberg concluded "there is no evidence" that pollution from Bruce Mansfield caused GH's alopecia. (*Id.* at 16.)

Plaintiffs attack Valberg's report on three grounds. First, there is no scientifically known minimum threshold dose of thallium that causes alopecia in humans, and the 310 mg referenced by Valberg is "misleading, unfairly prejudicial and entirely speculative." (ECF No. 121, at 6–7.) Second, Valberg calculated exposure solely based upon hand-to-mouth ingestion of soil and ignored dermal absorption and inhalation as exposure pathways. (*Id.* at 8.) Third, the WTC Assessment was designed for indoor use, and has not been validated for outdoor use. (*Id.* at 10–11.) The court concludes that these arguments either lack merit or are matters of credibility or weight, not admissibility. Valberg's opinions meet the threshold for admissibility.

With respect to the dose of thallium required to cause alopecia, Valberg's report identifies 310 mg as the "lowest estimate of actual thallium intake (as opposed to an indirect measurement of blood or urine)" known to cause alopecia in an adult. (Valberg Rep. 14, ECF No. 121-2.) The court does not find this statement misleading, speculative, or unfairly prejudicial. Valberg's report does not suggest that this amount "is the lowest 'required' dose for alopecia," as asserted by plaintiffs. (ECF No. 121, at 6.) Plaintiffs can elicit testimony regarding the limitations of the 310 mg figure on cross-examination, reducing any risk for confusion by the jury.

Valberg's failure to include inhalation and dermal absorption pathways in his exposure estimate does not render his opinion inadmissibly unreliable. Valberg concluded that ingestion, particularly for a pica child, would be the "largest contributor to dose." (Valberg Rep. 5, ECF No. 121-2.) Due to the size of the particles, only a "very small" amount of material could be expected to reach the body by inhalation. (*Id.*) Because thallium is an inorganic metal, there would be little dermal

absorption. (Hr'g Tr. 105:2–15, Oct. 16, 2013, ECF No. 162.) The WTC Assessment did not consider dermal absorption of metal to be a relevant exposure pathway. (*Id.* 105:12–13.) The court finds that Valberg excluded inhalation and dermal absorption after a reasoned analysis. Whether Valberg's failure to include these exposure pathways leads to a faulty conclusion is a credibility determination for the jury, or goes to the weight to be afforded to the testimony by the jury, and is not a matter of admissibility.

The WTC Assessment was designed for indoor dust exposure. (Valberg Rep. 6., ECF No. 121-2.) Valberg testified that

> [t]he heart of the [WTC Assessment] method is child behavior, how do they touch surfaces and how they touch their mouths subsequently to that. … Whether [GH] is indoors or outdoors is really not relevant to her behavior. And, in fact, if anything, indoor exposures typically have greater contact of children with surfaces and children with their mouths.

(Hr'g Tr. 117:18–118:1, ECF No. 162.) Valberg also made a number of conservative estimates with respect to GH's pica behavior, doubling the fraction of material transferred from surface to skin and doubling the frequency of hand-to-mouth events. (Valberg Rep. 14, ECF No. 121-2.) The court concludes that the WTC Assessment is sufficiently reliable in this context in light of the conservative approaches testified to by Valberg. The jury can consider the application of the WTC Assessment in weighing Valberg's testimony.

Plaintiffs' motion will be denied.

C. Defendant's Motion to Preclude the Testimony of Smith

Smith prepared an expert report, dated December 3, 2012 ("Smith Rep."), to rebut the report submitted by Valberg. Smith relied on the work of Jeffery Foran, who prepared an expert report for plaintiffs, but subsequently withdrew from the case due to a change in his employment. (Smith Rep. 1, 7, ECF No. 104-4.) Smith also reviewed field notes and deposition testimony. (*Id.* at 2.) Smith criticized Valberg's

report on a variety of grounds, particularly Valberg's use of the WTC Assessment and failure to consider the inhalation and dermal absorption pathways, which Smith opined "are likely to significantly add to [GH's] arsenic and thallium exposure." (*Id.* at 6.) By including a dermal absorption pathway, Smith found a six-fold increase from Valberg's estimated thallium dose. (Hr'g Tr. 8:1–7, Oct. 16, 2013, ECF No. 162.) Smith calculated an upper and lower bound for GH's thallium exposure, concluding that it was between 3.3 mg and 0.02 mg. (*Id.* at 8:21–10:4.) Smith testified that both the upper and lower bound figures are within the range that could cause alopecia in humans. (*Id.* at 10:17–11:5.) Smith concluded that GH's alopecia was "more likely than not … caused by her exposure to thallium in deposited soot." (Smith Rep. 11, ECF No. 11-4.)

Defendant challenges Smith's report on four grounds: (1) Smith lacked the requisite degree of certainty for his opinions to be admissible; (2) Smith failed to determine the level of thallium exposure necessary to cause hair loss in humans; (3) Smith's attempt to calculate the exposure of GH is unreliable; and (4) Smith failed to conduct a differential diagnosis and rule out other potential causes of GH's alopecia. As set forth below, the court finds that Smith's testimony meets the threshold for admissibility.

1. Requisite Degree of Certainty

Defendant points to a number of equivocal statements in Smith's deposition testimony. (ECF No. 103, at 4–6.) For example, Smith testified that GH "may have been" exposed to contaminants. (Smith Dep. 464:17–20, ECF No. 104-6.) He stated, "I don't know that we have the ability to assess accurately the exposure of [GH] to those contaminants after the fact." (*Id.* at 464:20–23.) Smith testified that thallium "could have caused" GH's hair loss. (*Id.* at 469:15–18.)

In diversity cases, federal courts must apply state law with respect to the degree of certainty required of an expert opinion. *Heller*, 167 F.3d at 153 n.4. Under

Pennsylvania law, "a doctor can give an opinion on the cause of a plaintiff's illness if he or she can do so with a *reasonable degree* of medical certainty." *Id.* To determine whether an expert has reached an opinion with the requisite degree of medical certainty, the court must consider the expert's testimony in its entirety. *Hall v. Babcok & Wilcox Co.*, 69 F. Supp. 2d 716, 722 (W.D. Pa. 1999).

After reviewing Smith's report and testimony as a whole, the court concludes that the equivocal statements in Smith's deposition testimony do not render his opinion inadmissibly uncertain. Smith reached the opinions in his report "to a degree of scientific certainty." (Smith Rep. 11, ECF No. 104-4.) Smith testified at the *Daubert* hearing that he held his opinions to a reasonable degree of certainty. (Hr'g Tr. 10:25–11:5, 12:14–14:5, ECF No. 162.) Smith testified that his degree of confidence was better than fifty percent. (*Id.* at 11:17–20.) *See Hall*, 69 F. Supp. 2d at 722 (finding testimony on the whole "sufficiently firm, certain and unequivocal").

2. Failure to Determine the Dose of Thallium Needed to Cause Alopecia

Defendant asserts that, although Smith reviewed animal tests, agency studies, and case studies, his analysis was insufficient on the issue of "thallium effects in humans from subacute or acute exposure." (ECF No. 103, at 7.) Defendant quoted the Court of Appeals for the Eleventh for the proposition that "'[t]he link between an expert's opinions and the dose-response relationship is a key element of reliability in toxic tort cases.'" *McClain v. Metabolife Int'l, Inc.*, 401 F.3d 1233, 1241 n.6 (11th Cir. 2005). While the court agrees with this proposition, it notes that the Eleventh Circuit clarified that "[o]ne should not conclude from this analysis that to pass *Daubert* muster an expert must give precise numbers about a dose-response relationship. Some ambiguity about individual responses is expected." *Id.* The expert at issue in *McClain* provided no evidence about a dose-response relationship for ephedrine and gave only vague testimony about individual variations, leaving "a muddle of ambiguity that undermine[d] his opinions." *Id.* at 1241.

Smith, on the other hand, did consider the amount of thallium necessary to cause alopecia in humans. Smith reviewed two animal testing studies that showed alopecia could develop in rats at thallium intakes of 1.2 mg/kg per day and 0.3 mg/kg per day. (Smith Rep. 8, ECF No. 104-4.) Smith also considered case studies of thallium-induced alopecia in humans—the same cases relied upon by Valberg. (*Id.* at 7, 9.) Any inadequacies in Smith's testimony due to extrapolating from animal testing data or applying the case studies may be tested through the adversary process. *See Mitchell*, 365 F.3d at 244.

3. Unreliable Methodology in Calculating GH's Thallium Dose

Defendant argues that Smith's calculation of GH's thallium dose is unreliable because he (1) ignored actual soil sample results, (2) used an exposure period longer than that supported by the facts, (3) unrealistically assumed that GH ate ten grams of pure soot per day, (4) improperly assumed that 100 percent of thallium contacted was absorbed through the skin, and (5) failed to account for clearance of thallium from the body. Plaintiffs argue that these assumptions were reasonable and based on Smith's risk assessment experience. (ECF No. 149, at 13.)

Soil samples from the property where GH was allegedly exposed showed no detectable levels of thallium. (Hr'g Tr. 41:3–8, Oct. 16, 2013, ECF No 162.) These samples were taken in November 2011, more than five years after the alleged exposure. Although Smith testified that thallium metal can persist in soil, (*id.* at 41:25–42:7), the court does not fault Smith for excluding this data so far removed from the time of the incident. Plaintiffs reasonably argue that since the soot was deposited in clumps, it may have been concentrated in some locations and not others. (ECF No. 149, at 20–21.) The 2011 sampling is not necessarily probative of the conditions in July 2006.

Defendant challenges Smith's use of a fourteen-day exposure period, arguing that it has no basis in the facts and is "essentially random." (ECF No. 103, at 13.)

Smith noted that the washing of surfaces around the property may have acted to concentrate the deposited metals. (Smith Rep. 3, ECF No. 104-4.) Since thallium does not degrade in the environment, GH could have been exposed to the contaminants over an extended period. (*Id.*) The court finds that Smith's assumption of a fourteen-day exposure has a least some factual basis. Whether a prolonged fourteen-day exposure is likely is a matter for the jury to determine in weighing Smith's testimony in light of the facts surrounding the black rain event and subsequent clean up.

Smith made a number of additional assumptions in reaching his upper-bound estimate of 3.3 mg of thallium. (Hr'g Tr. 54:22–25, Oct. 16, 2013, ECF No 162.) He assumed that GH ate ten grams of soot per day, that 100 percent of thallium on the skin was absorbed, and that no thallium was eliminated or "cleared" from the body during the exposure period. He admitted that these assumptions were designed to be "health protective" and produced "an unrealistically high estimate." (*Id.* at 69:6–9, 78:10–79:3.) GH's "actual exposure is likely to be less" than Smith's upper-bound estimate. (*Id.* at 54:25–55:1.) The layers of "health protective" assumptions in the upper-bound estimate produce an exaggerated result. This upper-bound estimate could be misleading to the trier of fact and is not helpful.

Smith calculated a lower-bound estimate based upon the WTC Assessment methodology used by Valberg. (Smith Rep. 7, ECF No. 104-4.) Smith applied the WTC Assessment methodology with a fourteen-day exposure period and dermal contact exposure pathway, and he computed a dose 0.02 mg. (*Id.*) Smith testified that this lower-bound estimate was still within the range of thallium exposure that could cause alopecia. (Hr'g Tr. 10:25–11:2, Oct. 16, 2013, ECF No. 162.) Smith may testify that this estimate is the lower bound and the likely exposure was higher. If the defendant "opens the door" about the upper bounds, Smith will be able to testify about the upper bound he reported, although he must acknowledge it is unrealistic.

Plaintiffs are not presenting Smith to make a medical diagnosis, and he offers no such opinion. Smith is being presented to rebut Valberg and to offer a general causation opinion that GH was exposed to an "increased risk of harm." (*Id.* at 26:22–27:16.) Because Smith is offering a general opinion and not a medical diagnosis or specific causation opinion, the court finds his methodology sufficiently reliable, subject to the limitations noted.

4. Failure to Conduct a Differential Diagnosis

Defendant argues that Smith's opinions are inadmissible because he failed to make a differential diagnosis by ruling out other causes of GH's alopecia. This argument is moot. Smith is not testifying as a medical expert, offering a medical diagnosis, or opining as to specific causation. Smith is offering a general opinion that exposure to thallium increased GH's risk of harm. (ECF No. 149, at 24; Hr'g Tr. 26:22–27:16, 29:8–10, Oct. 16, 2013, ECF No. 162.)

D. Plaintiffs' Motion to Limit the Testimony of Vale

Vale is a medical doctor and toxicologist who has clinical experience with thallium poisoning. Based on his experience and review of expert reports and deposition testimony, Vale concluded that "there is no objective evidence that [GH] was exposed to thallium (or arsenic) in sufficient amount to give rise to alopecia or other features.' (Vale Rep. ¶ 94, ECF No. 136-5.) Plaintiffs object to Vale's opinion that GH's exposure to thallium was not sufficient to cause alopecia because Vale testified he does not know the body burden of thallium needed to cause alopecia.[4] (ECF No. 123, at 8.)

The problem is that the amount of thallium that causes alopecia in humans is not scientifically known. The court concluded in its analysis of the motion to exclude

4 "Body burden" is "the total amount of the substance in the body." (Vale Dep. 41:1–42:9, Apr. 19, 2013, ECF No. 123-2.)

Gochfeld that the lack of knowledge about this threshold amount does not preclude an expert opinion that GH's hair loss was or was not caused by thallium poisoning. Vale may opine on the typical symptoms of thallium poisoning. (Vale Rep. ¶¶ 83–90, ECF No. 136-5.) Vale may also offer an opinion, based on his review of the documents in this case and his experience with thallium poisoning, that GH was not suffering from thallium poisoning. (*Id.* ¶ 94.)

Plaintiffs also object to language in Vale's report vouching for other experts without independently verifying their analysis. As the court stated on the record at the hearing on October 16, 2013, the "vouching" language will be stricken from the report, and Vale will be precluded from offering such testimony. (Hr'g Tr. 184:11–185:16, Oct. 16, 2013, ECF No. 162.)

IV. Conclusion

Defendant's motion to preclude the testimony of Gochfeld will be denied. Defendant's motion to preclude the testimony of Smith will be denied in part. Smith's testimony will be subject to the limitations set forth with respect to his upper-bound estimate. Plaintiffs' motion to limit the testimony of Valberg will be denied. Plaintiffs' motion to limit the testimony of Vale will be granted in part and denied in part. An appropriate order will be entered.

Dated: March 5, 2014

/s/ Joy Flowers Conti
Joy Flowers Conti
Chief United States District Judge