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In this issue, Michael Fox reports on a recent decision from the Tenth Circuit in a benzene exposure case, where the court found the plaintiff's expert's differential diagnosis inherently unreliable because the cause of the leukemia at issue is unknown most of the time.

Tenth Circuit *Daubert* Ruling Bars Plaintiff Expert's AML Benzene Opinion Based on Differential Diagnosis

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Introduction

Proving medical causation in a toxic tort case is a two-step analysis that first requires proof of general causation – the substance is capable of causing a particular disease in the general population – and then requires proof of specific causation – the plaintiff’s exposure actually caused the disease. An expert’s differential diagnosis applied to specific causation determinations, i.e., differential etiology, “rules in” all scientifically plausible causes of the injury and then “rules out” the least plausible causes until only the most likely remains. In *Hall v. Conoco, Inc.*, 886 F.3d 1308 (10th Cir. 2018), the Tenth Circuit recently found that the district court properly excluded the plaintiff’s oncologist’s differential diagnosis that exposure to benzene caused the plaintiff’s acute myeloid leukemia (AML) because the expert failed to justify ruling out unknown or idiopathic causes, which account for more than half of AML cases. The court’s opinion establishes that, when the cause of a disease is unknown most of the time and cannot be ruled out, an expert’s differential diagnosis attributing the disease to toxic exposure should be disregarded and excluded as unreliable.

Background

In *Hall*, the plaintiff alleged that she developed AML from her childhood

exposure to benzene emissions from a nearby refinery. In the district court, she sought to prove this link through the expert testimony of an air modeler, an oncologist, and an epidemiologist. The air modeler estimated the benzene concentrations near where the plaintiff had lived and, based on those estimates, the oncologist and epidemiologist calculated the plaintiff’s cumulative exposure to benzene and then used the calculation to opine that benzene exposure had caused the plaintiff’s leukemia. The district court granted the defendants’ motions to exclude the expert testimony and for summary judgment, concluding that the plaintiff had not presented sufficient evidence linking her disease to benzene exposure. On appeal, the Tenth Circuit affirmed, finding that the district court did not abuse its discretion in excluding the expert testimony.

Benzene and AML

Benzene is a natural organic compound with a sweet odor that evaporates quickly into the air and dissolves slightly in water. Natural sources of benzene include volcanoes, forest fires, and crude oil, and it is used to make other chemicals and products including plastics, resins, nylon and synthetic fibers, rubbers, lubricants, dyes, detergents, drugs, and pesticides.¹ Benzene exposure can cause some cancers such as AML,² other known causes of which include

¹ ATDSR, Toxicological Profile for Benzene (August 2007):

<https://www.atsdr.cdc.gov/toxprofiles/tp.asp?id=40&tid=14>

² *Id.*

chemotherapy, radiation, and smoking.³ However, the vast majority of AML cases are idiopathic in origin.⁴

Daubert and Differential Etiology

Under Federal Rule of Evidence 702, a qualified expert may provide opinion testimony if:

- “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;”
- “the testimony is based on sufficient facts or data;”
- “the testimony is the product of reliable principles and methods; and”
- “the expert has reliably applied the principles and methods to the facts of the case.”

Before the testimony may be admitted, the district court must determine that the proposed testimony is reliable, and the gatekeeping inquiry must be tied to the facts of a particular case.⁵

Differential etiology was recently explained in the IADC’s *Defense Counsel Journal*:

³<https://www.cancer.org/cancer/acute-myeloid-leukemia.html>

⁴ *Id.*

⁵ *Daubert v. Merrell Dow Pharm.*, 509 U.S. 579, 589 (1983); *Kumho Tire Co. v. Carmichael*, 526 U.S. 137, 150 (1999).

In medicine, a differential diagnosis is a technique physicians sometimes use to identify the cause of a patient’s symptoms ..., [and] the process is intended to result in a medical diagnosis. The term “differential diagnosis” has often been used in toxic tort litigation to mean something completely different. A plaintiff who files a toxic tort case should already have a medical diagnosis. Indeed, it should be the diagnosis which leads the plaintiff to file the lawsuit in the first place. The toxic tort “differential diagnosis” is not a diagnosis at all, but rather a method whereby a plaintiff’s expert purports to “rule in” various potential causes for the plaintiff’s illness and then to “rule out” alternative causes until only one cause remains. It should come as no surprise to defense attorneys that, when a plaintiff’s expert uses the technique, it inevitably points to the defendant. The more accurate name for the technique as used in litigation is “differential etiology.”⁶

As further noted in comments to the Restatement (Third) of Torts’ discussion of a plaintiff’s burden of proof:

The likelihood that an agent caused an individual’s disease may be refined

⁶ Anthony G. Hopp; Jeremy S. Goldkind; David M. Cummings, *Differential Diagnosis and Daubert: Preventing the Misuse of Differential Etiology to Prove Causation in Toxic Tort Cases*, 84 Def. Counsel J. 1, 26 (2017)

when there are independent, alternative known causes of the disease. The underlying premise is that each of these known causes is independently responsible for some proportion of the disease in a given population. Eliminating one or more of these as a possible cause for a specific plaintiff's disease increases the probability that the agent in question was responsible for that plaintiff's disease. Courts frequently refer to the elimination of other known causes for a plaintiff by employing the medical terminology of "differential diagnosis." Assessing whether other causes can be ruled out (or in) as potential causes of a plaintiff's disease can provide probative evidence of specific causation. This technique is more accurately described as a "differential etiology." It is most useful when the causes of a substantial proportion of the disease are known. Then, the presence (or absence) of these causes for the specific plaintiff affects the probability that the agent in question caused the plaintiff's illness. When the causes of a disease are largely unknown, however, differential etiology is of little assistance. Evidence about biological mechanisms may also alter the likelihood that

exposure to the substance caused plaintiff's disease, either by ruling out other known causes or by explaining why the suspected agent is a more likely cause of the disease than others.⁷

According to the Sixth Circuit, "[n]one of this means that physicians may not testify to etiology[,] ... only that courts must apply the *Daubert* principles carefully in considering it."⁸ "Calling something a 'differential diagnosis' or 'differential etiology' does not by itself answer the reliability question but prompts three more: (1) Did the expert make an accurate diagnosis of the nature of the disease? (2) Did the expert reliably rule in the possible causes of it? (3) Did the expert reliably rule out the rejected causes? If the court answers 'no' to any of these questions, the court must exclude the ultimate conclusion reached."⁹

As the plaintiff has the burden to prove that the defendant's tortious conduct was a factual cause of the plaintiff's harm, courts have found that, where the majority of cases of the disease at issue have no known cause, and where the plaintiff's expert fails to investigate, analyze, or search for other possible causes, an expert's differential

⁷ Restatement (Third) of Torts: Liab. for Physical and Emotional Harm § 28 cmt. c(4)(Am. Law. Inst. 2010).

⁸ *Tamraz v. Lincoln Elec.*, 620 F.3d 665, 673 (6th Cir. 2010); see also Joe G. Hollingsworth and Eric G. Lasker, *The Case Against Differential Diagnosis: Daubert, Medical Causation Testimony, and the*

Scientific Method, 37 J. Health L. 1, 85 (2004)("trial courts must evaluate carefully the expert's conclusion to determine whether it is based on 'the same level of intellectual rigor' that characterizes a differential diagnosis conducted in normal clinical practice").

⁹ *Tamraz* at 674.

diagnosis or etiology will not satisfy *Daubert*.¹⁰

In *Bland*, the plaintiff alleged that exposure to freon caused her exercise-induced asthma, which was diagnosed several weeks after the alleged exposure without any data regarding what exposure levels would involve an appreciable risk of asthma or the plaintiff's actual exposure level. The Eighth Circuit found that, because the plaintiff's expert determined freon to be "the most probable cause" of the plaintiff's asthma without supporting data and without investigating and analyzing the plaintiff's home or other environments in search of other possible causes, and since the cause of exercise-induced asthma in the majority of cases is unknown, the differential diagnosis did not satisfy *Daubert* and was properly excluded.¹¹

In *Tamraz*, a welding rod exposure case, the plaintiff's expert neurologist diagnosed "manganese-induced parkinsonism" based on his unproven hypothesis that manganese exposure caused the plaintiff's Parkinson's disease, even though the disease "occurs commonly in the general population and usually without any known cause."¹² In reversing the plaintiff's judgment, the Sixth Circuit found that the district court should have excluded the expert neurologist's

opinion because his efforts to rule in manganese exposure as a possible cause of the plaintiff's Parkinson's Disease or to rule out other possible causes of the disease turned only on speculation and not a valid methodology.¹³

In a benzene exposure case, the First Circuit rejected the plaintiff's expert's use of a differential diagnosis which ruled out idiopathic causes solely based on the expert's unreliable opinion ruling in benzene.¹⁴ In *Milward*, the plaintiff's expert occupational medicine physician purported to rule in benzene as a cause of the acute promyelocytic leukemia (APL) based on (1) a no-safe threshold determination, even though benzene is naturally occurring; and (2) certain epidemiological studies which established that an individual's relative risk of developing APL increases when exposed to specified amounts of benzene, but without explaining why she chose to rely on those studies or addressing any study with contrary findings.¹⁵ The expert then ruled out idiopathic causes ("roughly 70–80% of all APL diagnoses") solely because she had (unreliably) ruled in benzene.¹⁶ The First Circuit determined that the district court properly excluded the no-safe threshold and relative risk opinions as unreliable, and, without some other basis to rule out

¹⁰ See, e.g., *Bland v. Verizon Wireless, (VAW) LLC*, 538 F.3d 893 (8th Cir. 2008)(freon exposure alleged to have caused exercise-induced asthma); *Tamraz*, 620 F.3d at 674 (manganese alleged to have caused Parkinson's disease); *Milward v. Rust-Oleum*, 820 F.3d 469 (1st Cir. 2016)(benzene alleged to have caused leukemia).

¹¹ *Bland*, 538 F.3d at 897-898.

¹² *Tamraz*, 620 F.3d 671.

¹³ *Id.* at 674.

¹⁴ *Milward*, 820 F.3d at 476.

¹⁵ *Id.* at 471-472.

¹⁶ *Id.* at 475-476.

idiopathic causes, found that the differential diagnosis was also properly excluded.¹⁷

Predominance of Idiopathic Causes Renders Differential Etiology Inherently Unreliable

As indicated above, the courts in *Bland*, *Tamraz*, and *Milward* rejected the plaintiff's experts' differential etiologies because they unreliably ruled in exposures to toxins before summarily and unreliably ruling out idiopathic causes. That is, the courts excluded the ultimate conclusions reached because the experts did not reliably rule in the toxins as possible causes of the diseases.

In *Hall*, the Tenth Circuit went a step further: the expert's differential etiology was excluded because, even if benzene could be ruled in as a potential cause of the plaintiff's AML,¹⁸ the expert did not rule out the possibility of an idiopathic cause.¹⁹ "This omission concerned the district court because the evidence had pointed to idiopathic causes in most cases of [AML], and the district court could reasonably view the failure to rule out idiopathic causes a fatal error tainting the differential diagnosis."²⁰ Indeed, the court found that, because idiopathy accounts for more than half of the cases of AML, the plaintiff's expert's differential etiology could be considered "inherently unreliable."²¹ While an expert need not categorically exclude each and

every possible cause, this "does not preclude a district court from questioning the reliability of a differential diagnosis when the cause of disease is unknown most of the time."²²

Conclusion

Although a plaintiff's expert's use of differential etiology to establish specific causation will inevitably point to the defendants, when idiopathy accounts for more than half of the cases of the disease at issue, the Tenth Circuit's *Hall* decision now arms defendants and trial courts with authority to exclude such opinions as inherently unreliable.

¹⁷ *Id.* at 476.

¹⁸ Numerous errors and inconsistencies undermined the expert's ruling in of benzene exposure as a potential cause of the plaintiff's AML and rendered the opinion unreliable. *Hall*, 886 F.3d at 1314.

¹⁹ *Ibid.*

²⁰ *Ibid.*

²¹ *Id.* at 1315.

²² *Id.* at 1316.

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