Quackery and Junk Science

By Melody C. Kiella and David M. Wilson

What It Is, Why It Matters, and How To Spot It

"I know it is common to speak of the 'good old days' of snake oil and soothing syrup as though they were gone forever. The amazing fact is that to a very great extent those good old days, so-called, are still with us." – Commissioner George P. Larrick, Food and Drug Administration, 1955.

While "quack" conjures up images of shady peddlers and salesmen, spotting a quack is not always as easy as you may think

Quackery has been around since civilized society began. The term "quack" is often used to describe a person who misrepresents the physical condition of his patient, the reasonableness or efficacy of his "medical" treatment, or his education, training, and skill in diagnosing and treating the medical condition at issue. (*Quackery in California*, 11 STAN. L. REV. 265, 267 (1959)). Similarly, a device, drug or treatment may be deemed a "quack" remedy when it is detrimental to one's health or has no proven value for treating or curing the condition at issue. (Id. at 296, n. 4). While "quack" conjures up images of shady peddlers and salesmen, spotting a quack is not always as easy as you may think. "Many common treatments exist in that disconcertingly large, messy grey zone between overt quackery and proven, uncontroversial medicine." (P. Ingraham, *Pseudo- Quackery in the Treatment of Pain* (2021)). Oftentimes pseudo-quackery is recommended to patients under the guise of a "promising" or "up-and-coming" a treatment in a manner that leads patients to believe the treatment is already proven to work. (*Id.*) The idea of a "promising" treatment is sold by smooth and persuasive talkers who tout their "significant experience" and offer those desperate for relief (and a little sympathy) a dose of hope and reassurance that their pain will miraculously disappear. (W. H. Gordon, M.D., *Why People Go to Quacks* (1966), p. 45); J. H. Young, Ph.D., *Why Quackery Persists* (2001)).

Quackery Then and Now

Quackery "began when the first knave met the first fool." (*A Historian's View of Quackery in 1974* (2016)). Colonial America was certainly a breeding ground for quackery. (*Id.*) Nicholas Knopp, who immigrated from England in 1630, concocted the "cure to scurvy" that was really just water "of no worth nor value" sold at a very high price to the gullible. (*Id.; The Myths and Mysteries and Hunt for Nicholas Knapp* (2017)). Throughout the 1800's, German immigrant William Radam sold "Microbe Killer" which, according to Radam and the glass bottle it came in, cured *all* diseases. (*Id.*) However, like Knopp's "snake oil" concoction, Microbe Killer was nothing more than a diluted solution of sulfuric acid and red wine that, when taken in large quantities, was actually poisonous (*Id.*) Despite

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the advancements and regulation in medicine, quackery is still prevalent and looks strikingly similar to the "cures" sold by Knopp and Radam.

Today, quackery looks like the "Miracle Mineral Solution" (really just industrial-strength bleach) marketed as a cure for HIV, malaria, and Covid-19 and the patently false promise made by Theranos regarding the ability of its "technology" to perform 240 blood diagnostic tests with only one single drop of blood. The reason for this? Just as it was in Colonial America, "there is a great deal of money to be made making false medical claims to people desperate for relief or a cure." (*Quackery Then and Now*, ***www.sciencebasedmedicine.com***). As long as there is a monetary incentive, the push for "quack" medicines, treatments and devices will continue into the future.

Quackery Leads to Junk Science in the Courtroom

While quackery involves misrepresentations as to the patient's condition and/or the effectiveness of recommended treatment, "junk science" refers to the use of "scientific" evidence or testimony that is the result of questionable methodologies used to reach unsupported conclusions. (Gutheil & Bursztajn, *Attorney Abuses of Daubert Hearings: Junk Science, Junk Law, or Just Plain Obstruction?* 33 J. AM. ACAD. PSYCHIATRY L. 1150 (2005); N. Prefontaine, *Talcum Powder and Expert Power: Admissibility Standards of Scientific Testimony*, 59 JURIMETRICS 341, 351 (2019)). Naturally, quack medicine and treatment leads to junk science in the courtroom, oftentimes in the form of unsupported causation opinions and unsupported conclusions as to the condition of the plaintiff, the "necessary" treatment, and the efficacy of such treatment. At its core, the battle over junk science in the courtroom "is ultimately intended to prevent fraud on society and the legal system" as there "is hardly anything, not palpably absurd on its face, that cannot be proven by some so-called experts." (*Chaulk v. Volkswagen of Am., Inc.*, 808 F.2d 639, 644 (7th Cir. 1986); D. Thornburg, *Junk Science – The Lawyer's Ethical Responsibilities*, 25 FORDHAM URB. L.J., 449, 452 (1998); H.P. Sorett, *Junk Science in the States: The Battle Lines*, ATL. LEGAL FOUND. (2000), at p. 31)).

Any discussion regarding "junk science" naturally involves the U.S. Supreme Court's decision in *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579 (1993), and its progeny. In *Daubert*, the "Court focused upon the admissibility of scientific expert testimony [and] pointed out that such testimony is admissible only if it is both relevant and reliable." (*Id.* at 589). While *Daubert* demands that judges act as gatekeepers tasked with preventing pseudo or "junk science" from infiltrating courtrooms, judges must first be educated on what constitutes science and a reliable methodology. One major flaw of *Daubert* and its progeny lies in the fact that it leaves judges, who are "generally unversed in, and even adverse to, the sciences, without clear guidance or ample criteria upon which to predicate their decisions." (B. Billauer, *Admissibility of Scientific Evidence Under Daubert: The Fatal Flaws of "Falsifiability' and "Falsification"*, 22 B.U. J. SCI. & TECH. L. 21, 24 (2016)). Judge Posner expressed serious concern about the lack of scientific literacy displayed among judges and lawyers, emphasizing that such a lapse in knowledge and understanding "is worth notice because it is indicative of a widespread, and increasingly troublesome, discomfort among lawyers and judges confronted by a scientific or other technological issue." (*Jackson v. Pollion*, 733 F.3d 786, 787 (7th Cir. 2013)).

Ultimately, *Daubert* places a heavy burden on judges and lawyers to understand and effectively and coherently translate scientific knowledge in a way that lends value to the understanding or resolution of legal disputes. As you can imagine, this lack of scientific sophistication can lead to unreliable expert evidence and testimony making its way into the courtroom despite the "protections" of *Daubert*.

Unlike litigation or trial, science centers on objective facts that are not the result of a single theory or result. (Peter Huber, *Junk Science in the Courtroom*, 26 Val. U. L. Rev. 723, 741 (1992)). Science "is a process of replication and verification, a search for consensus." (*Id.*) As Peter Huber explained,

> [T]he only reliable test for objectivity in science "is to determine what many different people can see in common, from different vantage points, in their waking hours. What individuals see alone, awake or in their dreams, is not science. A solitary white coat, test tube, and resume are not science. Modern science is not a solitary undertaking.

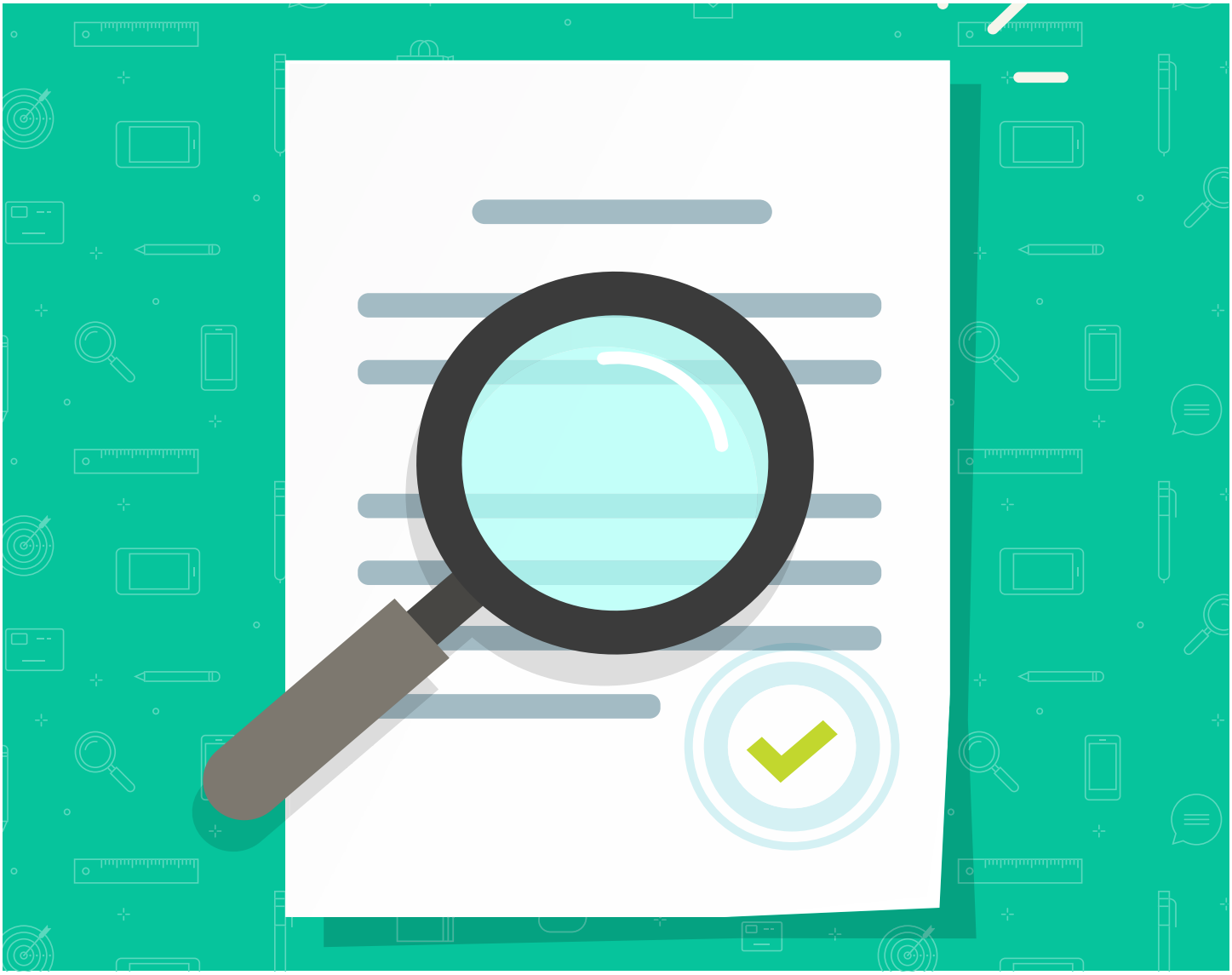
(*Id.*) In contrast, "the courtroom setting is discrete, insular, and closed – a one-shot decision." (*Id.* at 742-43). A "great paradox of modern liability science [is that,] in attempting to control quackery outside the courtroom, we invite quacks to the witness stand." (*Id.*). The reason quacks get invited into the courtroom is due to the complete lack of education and understanding of the methods of actual science, which are fundamentally different from those required in litigation. (*Id.*). Allowing quacks to offer "scientific" opinions under the guise that they are supported by the medical community inevitably results in scientific anarchy that infects the legal system's perception of science as a whole.

The only way to stop this deteriorating progression is for judges to "rediscovery rules of evidence consonant with the essential collegiality of modern science." (*Id.*). The rules necessary to execute this goal may not be self-evident, cannot be implemented mechanically, and will not work as intended if jurors do not understand and respect science. However daunting this task may seem, judges and lawyers need to remember that "[w]hatever his credentials, publications, or affiliations, a scientist who becomes the alter ego of a lawyer is no longer a scientist." (*Id.*).

Confusion Over the Methodologies Supporting a Causation Opinion

In addition to the legal profession's ineptness when it comes to science, lawyers and judges lack a basic understanding of the methodologies associated with (and the proper application of) a differential diagnosis and a differential etiology. Confused? You're definitely not alone.

Differential diagnosis is the method by which a doctor determines what disease or condition is causing the patient's symptoms, which is determined by considering "all relevant potential causes of the symptoms and then eliminating alternative causes based on a physical examination, clinical tests and a thorough case



history." (A. Hopp, *Differential Diagnosis and Daubert: Preventing the Misuse of Differential Etiology to Prove Causation in Toxic Tort Cases*, 84 DEF. COUNS. J. 1, 6 (2017)). In contrast, differential etiology "is a causation-determining methodology" used by a physician to determine the external cause of the condition, which is done by "ruling in" and "ruling out" potential causes of that condition before arriving at a final conclusion as to the cause. (*Id.* at 7). "In short, differential diagnosis is the act of distinguishing one disease from another to select a proper treatment," while differential etiology is used to determine the cause or causes of such condition, most often for litigation purposes. (*Id.; see also Higgins v. Koch Dev. Corp.*, 794 F.3d 697 (7th Cir. 2015) ("'Differential diagnosis actually refers to a method of diagnosing an ailment, not determining its cause."); M. B. Kent, Jr., *Daubert, Doctors and Differential Diagnosis: Treating Medical Causation Testimony As Evidence an Assessment of Admissibility Is Not the Same As an Assessment of Sufficiency, but Daubert Has Created That Confusion*, 66 DEF. COUNS. J. 525, 527 (1999)).

While differential diagnosis and differential etiology may seem quite similar, the differences are actually quite profound. (S. Spechler, *Physicians at the Gates of Daubert: A Look at the Admissibility of Differential Diagnosis Testimony to Show External Causation in Toxic Tort Litigation*, 26 Rev. Litig. 739, 744 (2007)). "The ability to diagnose medical conditions is not remotely the same . . . as the ability to deduce . . . in a scientifically reliable manner the causes of those medical conditions." (*Tamraz*, 620 F.3d at 673). Although doctors are taught how to perform a differential diagnosis and regularly do so in practice, there is very little training (if any at all) regarding differential etiology. (*Id.*) In most clinical settings, a physician only focuses on "causes" capable of producing a particular condition for purposes of recommending a course of treatment. (Sanders, et al., *Differential Etiology: Inferring Specific Causation in the Law from Group Data in Science*, 63 UNIV. OF HASTINGS 851, 858 (2011)). For example, an ER surgeon does not need to know that the defendant driver caused a significant collision with the patient's vehicle because he was intoxicated (*i.e.*, he does not need to consider external causes

of the patient's post-collision condition), but he does need to consider the symptoms or complaints associated with the resulting injuries, the location and condition of the injuries, and the patient's physical condition (heart rate, blood pressure, etc.) to diagnose the specific injuries and identify the best treatment for the injuries. In contrast, knowing whether the defendant's act of driving drunk proximately caused the accident is key to establishing the defendant's liability for the resulting injuries and damages.

The lack of sophistication in the legal profession regarding science and scientific methodologies has led to countless judicial opinions that conflate differential diagnosis with differential etiology.

Oftentimes this results in a finding that a physician's causation opinion is sound and reliable when, in reality, the opinion is based on nothing more than patient history and a physical examination. (*Organized Common Sense, supra*, at p. 441). The confusion as to these different methodologies may lie in the fact that both require the doctor to "rule in" and "rule out" various possible "causes." However, the "critical distinction is that, in the clinical setting, 'cause' *means diagnosis*, while in the legal setting 'cause' means a *proximate cause*." (A. Hopp, *Differential Diagnosis and Daubert: Preventing the Misuse of Differential Etiology to Prove Causation in Toxic Tort Cases*, 84 DEF. COUNS. J. 1, 12 (2017) (emphasis added)). Failing to understand this distinction inevitably leads to reliance on "a crude imitation of science, the unpublished hunch, the letter to the editor, the impressionistic 'mosaic theory,' in which the lawyer's science of harmonious coupling substitutes for systematic observation and analysis." (Huber, *supra*, at p. 744).

Deciphering Legitimate Scientific Opinions from Junk Science Based on Quackery

Although most courts regularly confuse differential diagnosis with differential etiology when considering the reliability of a causation opinion, some courts have acknowledged the difference in these methodologies and criticized those "experts" who rely on differential diagnosis to support causation. For example, the Sixth Circuit in *Tamraz v. Lincoln Electric Co.* excluded an expert's opinion that attempted to "elide the distinction between [plaintiff's] disease and what caused it," and emphasized that use of "diagnosis" and "etiology" interchangeably has allowed non-scientific opinions to make their way into the courtroom. (620 F.3d 665, 672-73 (6th Cir. 2010)). As the court explained, reliance on differential diagnosis "serves well in the clinic but not in the courtroom, where decision requires not just an educated hunch but at least a preponderance of the evidence." (*Id.* at 673). The court also observed that calling something a "differential diagnosis" does not satisfy the *Daubert* reliability question, but instead raises the following additional questions: (1) whether the expert made an accurate diagnosis of the nature of the condition, (2) whether the expert reliably ruled in the possible causes of that condition, and (3) whether the expert reliably ruled out the rejected causes. (*Id.* at 674). Similarly, the court in *Pluck v. BP Oil Pipeline Co.* found an expert's opinion regarding the cause of the plaintiff's disease unreliable because the exert did not rule out alternative causes and failed to identify his method for discounting other possible causes. (640 F.3d 671, 679-80 (6th Cir. 2011)). Likewise, the court in *Chapman v. Proctor & Gamble Distribution, LLC* rejected as unreliable an expert's causation opinion due to the expert's failure to address several other alternative causes and failure to explain why he excluded the other causes. (766 F.3d 1296, 1309-10 (11th Cir. 2014)).

In *Magbegor v. Triplette*, the plaintiff's orthopedic surgeon, Dr. Langer, opined that the motor vehicle accident at issue caused the plaintiff's shoulder injury because he did not observe any characteristics indicative of a chronic injury (which he defined as one or two years old). (212 F. Supp. 3d 1317, 1327 (N.D. Ga. 2016)). The court concluded that Dr. Langer's opinion failed to satisfy any of the standards set forth in Daubert. (*Id.*) Specifically, the court emphasized the lack of evidence supporting the central premises of his opinion (*i.e.*, that chronic shoulder injuries exhibit certain characteristics that were not observed in the clinical setting), nor was their evidence that the lack of these alleged characteristics reasonably led to the conclusion that the injury was chronic in nature. (*Id.*) More troublesome was the fact that Dr. Langer completely failed to account for any alternative causes despite his acknowledgment that pre-accident medical records showed prior complaints of shoulder pain with associated treatment and a long history of excessive use of the shoulder at issue. (*Id.* at 1328). Based on the foregoing, a lack of evidence that Dr. Langer's opinion was accepted by the medical community and his complete failure to conduct any independent inquiry into the accident (the speed of the vehicles, the force of the impact, the location of the impact, the direction plaintiff's body moved in response to the impact, or the position of the plaintiff inside the vehicle at the time of the impact), the court found his opinion unreliable despite his performance of a differential diagnosis. (*Id.*)

However, a differential etiology may not always be required. As a Georgia court explained,

> A few examples of typical cases include: the brittle-boned octogenarian who falls in the kitchen and breaks her hip; the defensive end who has his knee crushed by a 330–pound offense tackle and suffers an anterior cruciate tear; the woman who falls in a grocery store and suffers a fracture of her wrist; and the unbelted passenger who is ejected during a car wreck, lands on his head in a cotton field, and suffers a compression fracture of his cervical vertebra. In these typical cases, an

> orthopedist legitimately can adopt a patient's history as his causation opinion, since the patient has sustained a common injury in a way that it commonly occurs.

(*Bowers v. Norfolk S. Corp.*, 537 F. Supp. 2d 1343, 1359 (M.D. Ga. 2007)). In contrast, complex injury cases involving multiple possible causes or sources of impact/trauma and relevant pre- accident or post-accident incidents, injuries or conditions require more than a clinical differential diagnosis. (*Id.*)

Take, for example, a plaintiff with injuries to her lumbar spine that allegedly began after a train ride and evidence of a prior, recent history of low back pain and treatment. In such a case, an orthopedist's opinion that the vibrations from the train ride caused the plaintiff's injuries and pain will not meet the *Daubert* standards when the opinion is based solely on the patient history, a physical examination, and a review of studies and radiographs. (*Id.*) This is especially true if the orthopedist fails to consider and rule out other possible causes for her back pain (such as pre- existing causes), fails to explain why the vibrations of the train solely caused her injury, has no knowledge of the strength of these alleged vibrations, and fails to explain how the vibrations could have caused (and did in fact cause) either a new low back injury or exacerbated her pre-existing condition. (*Id.* at 1356).

Conclusion

Any scientifically sound opinion as to the cause of an injury or condition will always be based on the methodical observation of many patients or test subjects, not on one physician's impressions developed solely in the course of his clinical treatment of the plaintiff. (Huber, *supra*, at p. 746). The skills necessary to diagnose an injury and recommend a course of treatment are not the same skills required to determine the cause of the condition in question. (*Id.*) "The difference between the clinician and the scientist is one that courts must learn to the understand and affirm." (*Id.*) To do this, we need to remember why we seek the opinions of physicians in the first place. While some would argue that a physician is called to testify solely to support the plaintiff's injury claim or the defendant's defense, a physician who testifies with only that goal in mind is not a scientist capable of offering reliable scientific opinions.

Attorneys and judges must remember that we seek the opinions of physicians in personal injury cases to assist in understanding how the particular facts and circumstances of the case establish causation and that the causation opinion offered is recognized and understood by science and the medical community as a whole. If this were not the purpose, then could we not just rely on injured plaintiffs to offer speculative testimony that the accident caused their injuries? Sure, a speculative causation opinion based on nothing more than clinical observations and the physician's clinical experience often persuade defendants to fork over large sums of money before trial or convince a jury to award large damages to the plaintiff. But such idiosyncratic speculation is not in any way anchored in broad-based objective science and standards and, in reality, does nothing more than turn the physician into "just another lawyer, masquerading as a pundit." (*Id.*) And any doctor who engages in such quackery, resulting in the introduction of junk science, is in direct violation of their duty to ensure that they do not become an advocate in a legal proceeding. (*Id.* at 750).

Real science, as opposed to junk science, results in scientific facts or statements that can be proven true or false only after a finite, circumscribed inquiry. (*Id.* at 752-53). Real science is not an opinion cloaked in "mays," "mights," or "possibilities." (*Id.* at 753). As Huber explained, the "language of could, possibly, may, might, and maybe that so often litters fringe testimony in court is not the language of science. Nor is science a business of completely open-ended speculation, where any idea can be floated but none can ever be finally brought back to earth." (*Id.*). Anyone offering such a promise or opinion must not be confused with a real scientist capable of providing a reliable scientific opinion, as science has limits that real scientists respect and acknowledge. (*Id.* at 753-54).

In an effort to eradicate junk science in the courtroom and keep quacks from falsely touting themselves as "experts" before a jury, defense lawyers need to fully understand the difference between medical causation and legal causation and the scientific methodologies used to establish the same. Once these differences are understood, defense lawyers need to explain these differences to the court and opposing counsel each time they get the chance. As history has proven, it is not safe to assume that judges or lawyers understand science, the differences between differential diagnosis and differential etiology, or which methodology to apply. Only after lawyers and judges are properly educated as to these scientific issues can we expect to have any chance of ridding the legal system of the rife injustice that is continually perpetuated by an "expert" with a medical degree and nothing more than a speculative, narrow-minded, and unscientific opinion. Until this is accomplished, "what passes for science in court won't be." (*Id.* at 753).