MOTION TO EXCLUDE EXPERT TESTIMONY ON MICROSCOPIC HAIR COMPARISON, OR, IN THE ALTERNATIVE, TO CURTAIL SUCH TESTIMONY, UNDER *DAUBERT V. MERRELL DOW PHARMACEUTICALS*

[DEFENDANT], by counsel, respectfully moves this Court to exclude expert testimony on the subject of microscopic hair comparison, or, in the alternative, to curtail such testimony. Microscopic hair comparison used for the purpose of conclusively identifying a particular individual has been discredited by the scientific community, as laid out in a recent report by the National Academy of Sciences. As described below, microscopic hair comparison does not satisfy the standards for the admissibility of scientific evidence laid out in Daubert v. Merrell Dow Pharmaceuticals because there is no known rate of error, its conclusions are not quantifiable or testable, there are no uniform standards or criteria for reaching conclusions, the methodology is not the subject of publication in peer-reviewed, scientific journals, and microscopic hair comparison has been rejected by the scientific community. In addition, given this forensic method's significant shortcomings and thoroughly subjective nature, having an expert testify as to the conclusions of a microscopic hair comparison would greatly confuse the jury and would be far more prejudicial than probative.

I. STATEMENT OF FACTS

[FILL IN]

II. LEGAL STANDARD

Louisiana Code of Evidence article 702 provides the standard for the admission of expert testimony: "If scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact at 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." A trial court judge plays a "gatekeeping" role when it comes to expert testimony, "ensur[ing] that any and all scientific testimony or evidence admitted is not only relevant, but reliable." Daubert v. Merrell Dow Pharm., Inc., 509 U.S. 579, 589 (1993).[1]

Under Daubert, courts should weigh the following factors when considering the admission of expert testimony:

(1) whether a theory or technique is falsifiable; in other words, whether the technique can be or has been tested;

(2) whether the theory or practice has been published in scientific, peer-reviewed journals;

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[1] The Supreme Court of Louisiana has adopted the guidelines set forth by the U.S. Supreme Court in Daubert. State v. Foret, 628 So. 2d 1116, 1121 (La. 1993).

(3) whether the technique has a known or potential rate of error, and what that rate of error is;

(4) whether standards exist to control the technique's operation; and

(5) the technique's degree of acceptance within the scientific community.

Daubert, 509 U.S. at 589; State v. Young, 35 So. 3d 1042, 1047 (La. 2010).

The standard is flexible and no single factor is determinative. Daubert, 509 U.S. at 589. Importantly, the Daubert factors apply to established and novel theories and techniques alike. Id. The crucial consideration is whether the purported expertise, here microscopic hair analysis, is sufficiently scientifically valid to merit a fact-finder's reliance on it.

III. ARGUMENT

A. **Despite Its Long Acceptance by Courts, the Scientific Community Has Rejected Microscopic Hair Comparison as a Reliable Method of Identification.**

Until recently, federal and state courts have admitted microscopic hair analysis almost without exception, often without even applying Daubert factors, based on the assumption that the method is scientifically valid and the fact that past courts have accepted the method time and again. See, e.g., Charles v. Smith, 894 F.2d 718, 726 (5th Cir. 1990) (accepting reliability of microscopic hair comparison without question); Bryan v. Oklahoma, 935 P.2d 338, 359 n.62 (Okla. Crim. App. 1997). Courts admit this evidence on the assumption that microscopic hair comparison is widely accepted in the scientific community. E.g., McGrew v. Indiana, 682 N.E.2d 1289, 1292 (Ind. 1997) (accepting characterization that microscopic hair comparison has not been disputed by scientific community).

We now know that the scientific community has rejected the use of microscopic hair comparison to identify a specific person. A recent and thorough review of the scientific literature on microscopic hair comparison, mandated by Congress and performed by the prestigious National Academy of Sciences, concluded that microscopic hair comparison "cannot uniquely identify one person." Nat'l Acad. Sci., Strengthening Forensic Science in the United States: A Path Forward, at 161 (2010) (hereinafter "NAS Report"), available at http://books.nap.edu/openbook.php?record_id=12589. The sections that follow provide an overview of microscopic hair comparison and the National Academy of Sciences' evaluation of this forensic method.

1. *Overview of Microscopic Hair Comparison*

A microscopic hair comparison is conducted by mounting two hair samples side-by-side on a glass slide. Microscopy of Hair Part 1: A Practical Guide and Manual for Human Hairs, at section titled "Glass Microscopic Slide Preparation" (Jan. 2004), available at http://www2.fbi.gov/hq/lab/fsc/backissu/jan2004/research/2004_01_research01b.htm (hereinafter "FBI Guide"). The examiner views the entire hair from root to tip, looking for similarities and dissimilarities in three regions, known as the cuticle (the surface), the medulla (the central portion), and the cortex (the area between the cuticle and the medulla). Id. at section titled "Basic Structure of Hair."

Hair Diagram
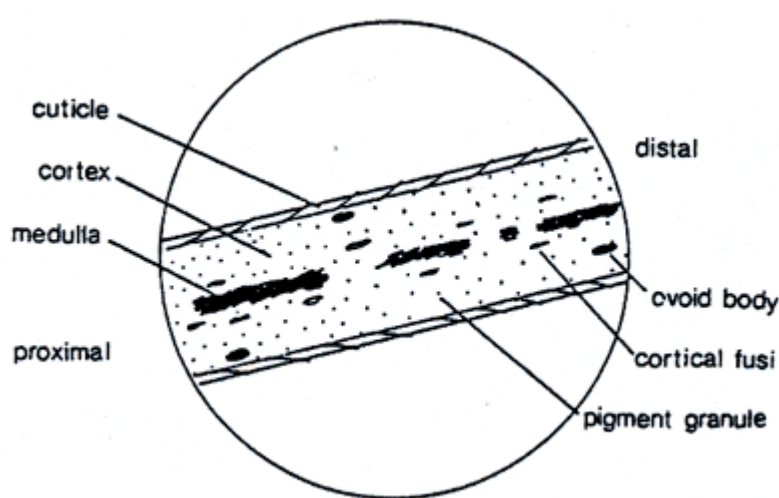
The examiner will look at an indeterminate number of characteristics of the hairs, searching for any points of similarity or dissimilarity. Id. at section titled "Human Hairs Identification." Such characteristics may include the color of the two hairs, their length, their diameter, the thickness and color of their cuticles, the shape and size of the scales in the cuticle, the distribution of pigment in the hairs, the shape and size of the medullas, whether the hairs share general racial characteristics, whether the hairs share general characteristics that relate to the area of the body where the hairs grew, whether the tips of the hairs were cut or split, whether the roots of the hairs indicate that the hairs were in a similar stage of development, the general appearance of the cortex, whether the hairs seem to have been subjected to artificial treatments, and whether the hairs exhibit similar patterns of damage. Id. at section titled "Human Hair Identification."

This list is not exhaustive because there is no agreement among forensic hair examiners about which characteristics provide a reliable basis for comparison and which do not. NAS Report at 158-59. In addition, there is no agreement about the weight that each characteristic should have in the overall comparison. FBI Guide at section titled "Comparison Characteristics." Finally, forensic examiners have no standard for how many characteristics must be similar or

dissimilar before they can conclude that two hairs came from the same source or different sources. Id.

The determination of whether a particular characteristic is similar or dissimilar is often entirely in the eyes of the examiner: "The categorization of hair features depends heavily on examiner proficiency and practical experience." NAS Report at 160-61; FBI Guide at section titled "Significance and Value." Some characteristics, such as hair length, are relatively objective and easy to verify. FBI Guide at section titled "Significance and Value." Other characteristics, such as similarities in the shapes of scales in the cuticle or the general appearance of the cortex, are far more subjective and open to interpretation. Id. These determinations are made solely by the individual examiner and whether similarities are observed is completely within the examiner's discretion, and so the method is thoroughly grounded in subjective interpretations. Id.

Finally, no studies have ever determined how common any of the above characteristic are in the human population. NAS Report at 158. For example, a person's medulla may be clear, opaque, in wafers, or bubbly, but scientists have never undertaken studies to estimate how many people have each kind of medulla. See FBI Guide at section titled "Significance and Value." This is significant because if an examiner cannot say which kinds of hair characteristics are common and which unusual, it is impossible to know how much weight any similar characteristics should bear in an overall comparison. Because of this critical shortcoming, hair examiners have no idea what the chances are that two hairs that look exactly alike actually came from two different people.

As forensic hair examiners should readily admit, hair samples cannot be used to absolutely identify a unique individual. NAS Report at 158; FBI Guide at section titled "Significance and Value." All that hair examiners may be able to determine are what body part the hair came from, generally what race the hair came from, and whether or not the two samples experienced similar types of damage. FBI Guide at section titled "Significance and Value." For these reasons, "a conclusion of a 'match' means only that the hair could have come from any person whose hair exhibited—within some levels of measurement uncertainties—the same microscopic characteristics." NAS Report at 159-60.

2.   *Evaluation of Microscopic Hair Comparison by the National Academy of Sciences*

On November 22, 2005, the Science, State, Justice, Commerce, and Related Agencies Appropriations Act of 2006 became law. 119 Stat. 2290 (2005). Through this act, Congress

directed the United States Attorney General to provide funding to the National Academy of Sciences ("NAS") to convene a committee, known at the Committee on Identifying the Needs of the Forensic Science Community, to study the current state and remaining needs of the forensic sciences. NAS Report at 2. This Committee was formed under the auspices of the NAS's Committee on Science, Technology, and Law and the Committee on Applied and Theoretical Statistics, and "was composed of many talented professionals, some expert in various areas of forensic science, others in law, and still others in different fields of science and engineering." Id. at xx. After three years of study, including a review of all published scientific literature related to particular forensic methods, the NAS issued a report that revealed that some forensic disciplines, including microscopic hair comparison, severely lack scientific validity. Id. at 3. The report's central finding was that other than DNA analysis, "no forensic method has been rigorously shown to have the capacity to consistently, and with a high degree of certainty, demonstrate a connection between evidence and a specific individual or source." Id. at 5. Additionally, imprecise or exaggerated expert testimony has sometimes contributed to the admission of erroneous or misleading evidence. Id. at 3.

In its review of microscopic hair comparison, the National Academy of Sciences thoroughly reviewed all of the literature relating to microscopic hair analysis, heard testimony from trained hair examiners, and reviewed cases in which hair comparisons were used as evidence, and the NAS found that the method cannot be used to identify a unique individual and that it readily leads to imprecise or exaggerated testimony. Id. at 160-61. The NAS Report noted that this forensic method is not a reliable way to identify individuals because of the great disparities in the ways that the comparisons are performed, a lack of standardization of operational principles, and, most importantly, its ultimate inability to demonstrate a connection between evidence and a specific individual. Id. at 161. The lack of standardization and disparities in examiners' methods stems from the fact that there are endless variations of hair samples, making it challenging for practitioners to determine the extent of variations in all known and unknown hair samples in order to set up a standard operating procedure. FBI Guide at section titled "Comparison Characteristics". The inability of hair comparisons to show a connection between a specific hair and a specific individual also derives from human error, which naturally occurs when an examiner makes "a subjective decision upon objective data with unarticulated standards and no statistical foundation for estimation of error rates." NAS Report at 153-54.

The NAS Report noted that if two hairs appear microscopically similar, they should be subjected to mitochondrial DNA analysis, a kind of DNA testing that can generate a DNA profile from hairs alone. Id. at 161. The NAS Report noted that there is "no scientific support for the use of hair comparisons for individualization in the absence of nuclear DNA." Id.

B.   **The Microscopic Hair Comparison Offered in This Case Is Unreliable and, Based on the Present Consensus of the Scientific Community, Should Be Excluded from This Trial.**

Here, the prosecution wishes to offer expert testimony related to microscopic hair analysis for the purpose of absolute identification—to show that a hair found at the crime scene came from the defendant. However, as discussed above, microscopic hair comparison is simply not a scientific—or even *reliable*—method for uniquely identifying an individual.

Furthermore, the examiner in this case did not specify what characteristics of the suspect's hair and the defendant's hair were similar and which characteristics were dissimilar, how much weight he gave each characteristic, how many characteristics he considered, or any other information that would allow a fact-finder to weigh the evidence appropriately. All we have is the examiner's bald assertion that the two hairs came from the same source, a conclusion that is simply impossible to prove, given the severe limitations of microscopic hair comparison.

The microscopic hair comparison offered in this case fails under each prong of the Daubert test:

- **Not quantifiable or testable:** The examiner's conclusion is a purely subjective statement that two objects had similar visual characteristics; such a conclusion is totally unquantifiable and so there is no way to determine the reliability of the examiner's analysis. NAS Report at 5-6.

- **Not falsifiable:** The only way to test the examiner's conclusion would be to submit the hairs to mitochondrial DNA testing, but that was not done in this case.

- **Not peer reviewed:** As discussed above, microscopic hair analysis as a scientific technique has not been successfully vetted through peer-reviewed scientific publications.

- **No known rate of error:** As the FBI noted in its guide to performing microscopic hair comparisons, this forensic method has no established rate of error. FBI Guide at section titled "Conclusions."

- **No standards:** As noted above, there are no generally accepted standards for microscopic hair comparison. Even the FBI's guide on performing microscopic hair comparisons notes that there are not a set number of characteristics that examiners must consider in their comparisons, and "[t]here is no criterion for the importance assigned to a particular characteristic [in a comparison]." Id. at section titled "Comparison Characteristics."

- **Not accepted by scientific community:** The National Academy of Sciences concluded that microscopic hair comparison "cannot uniquely identify one person." NAS Report at 161.

In State v. Young, 35 So. 3d 1042 (La. 2010), the Louisiana Supreme Court found that a trial court had abused its discretion in admitting expert testimony on the psychology of eyewitness identification. The Court based its ruling on three factors. First, the Court found that labeling someone an "expert" in the field of eyewitness identification would unduly influence the jury and may lead them to credit the expert's testimony more than the other evidence at trial. Id. at 1050. Second, the Court was concerned that jurors exposed to an eyewitness identification expert would be misled "into believing that a certain factor in an eyewitness identification makes the identification less reliable than it truly is." Id. Finally, the Court noted that expert testimony on eyewitness identification "can be more prejudicial than probative because it focuses on the things that produce error without reference to those factors that improve the accuracy of the identifications." Id.

This Court should bar expert testimony on microscopic hair comparison, just as the Supreme Court barred the admission of expert eyewitness identification testimony in Young. As noted above, an overriding concern in Young was that a potentially persuasive expert testifying as to the generalities of the inaccuracies of eyewitness observations—a matter the Court found had no scientific basis—would greatly influence the jury because he would be labeled an "expert." Here, an expert testifying as to similarities between known and unknown hairs—which, as discussed above, have no scientific meaning at all—would unfairly prejudice the jury because jurors would assume that the expert's opinion is reliable and scientifically valid. Merely being labeled as an expert in microscopic hair comparison will mislead the jury about this discredited forensic method. See id. (noting that "merely being labeled" an expert can unduly influence the jury); State v. Higgins, 898 So. 2d 1219, 1240 (La. 2005) (same); United States v. Angleton, 269 F.Supp.2d 868, 873-74 (S.D. Tx. 2003) (noting that the "aura" of testimony from an expert in a faulty discipline can mislead a jury to its validity); United States v. Lester, 254 F.Supp.2d 602, 608-09 (E.D. Va. 2003) (noting that expert testimony has the potential to be substantially prejudicial because of the "aura effect" associated with such testimony). In addition, if the hair examiner is allowed to testify that the similarities between the known and unknown hairs led him to conclude that they "matched," the jury will be misled into believing that the similarities make the identification far more reliable than it actually is. Finally, testimony from the hair examiner about his conclusion of a match would "be more prejudicial than probative because it [will]

focus[] on the things that [are similar in the hairs] without reference to those factors that [are dissimilar]." Young, 35 So. 3d at 1050.

C. **In the Alternative, this Court Should Limit the Scope of the Expert's Testimony to Exclude Any Conclusions of Absolute Identification Because Such Conclusions Grossly Exaggerate the Capabilities of Microscopic Hair Comparison.**

Expert testimony should be limited if there is a significant gap between the existing data and the conclusions drawn by the expert witness during testimony. General Elec. Co. v. Joiner, 522 U.S. 136, 146 (1997). In Joiner, an expert witness testified that a study found that the incidence of lung cancer deaths among workers was somewhat higher than would ordinarily expected due to their exposure to PCB's, but the trial court excluded his testimony because the studies he relied on did not support his conclusions, as there was "simply too great an analytical gap between the data and the opinion proffered." Id. An expert's testimony must be limited to those conclusions that are supported by the evidence and whatever scientific inquiry has been made into the field at issue.

Here, the hair examiner has issued a report stating that two of the hairs he examined came from the same source, but that conclusion is simply not valid. Without any idea of what characteristics of the hairs were found to be similar or dissimilar and how common or unusual those particular hair characteristics are in the human population, it is impossible to say with any accuracy how likely it is that two hairs came from the same source.

The only permissible testimony here—the only testimony that would be supported by the evidence—would be a recitation of the specific characteristics that the examiner found to be similar or dissimilar. Given that no reliable scientific study has ever been done to analyze the frequency of these characteristics in the human population, the hair examiner has no more idea than the jury does what inferences should be drawn from the similarities or differences, or whether one outweighs the other. The examiner cannot be permitted to testify about any conclusions he may have drawn from the similarities or differences, and he certainly cannot be permitted to testify that two hairs "matched." As discussed above, there is no scientific basis for such testimony.

IV. CONCLUSION

Under the applicable standards of Louisiana Code of Evidence article 702, this Court should only allow expert testimony that is reliable. Microscopic hair analysis is not a reliable method of absolute identification because of the great disparities in the ways that the

comparisons are performed, a lack of standardization of operational principles, and, most importantly, its inability to demonstrate a connection between evidence and a specific individual.

For these reasons and those set forth above, the defendant respectfully requests that this Court exclude the testimony of the hair examiner in this case. In the alternative, the defendant respectfully requests this Court to limit the scope of the examiner's testimony to a recitation of the hair characteristics that the examiner found to be similar and dissimilar.