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DNA EVIDENCE IN VIRGINIA

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scientific testimony, grounded in the methods and procedures of science, . . . [which] will assist the trier of fact to understand or determine facts and issues concerning defendant's intent and knowledge. The testimony is based on scientific knowledge, relating to hypotheses that can be and have been tested, techniques that have been subjected to peer review and publication, subject to reasonably acceptable potential rates of error, subject to standards controlling the techniques operation, and sufficiently accepted within the relevant scientific . . . community.[50]

The motion should also stress that the evidence is necessary to provide the defendant a fair trial guaranteed by the Fifth Amendment and as part of the "right to produce witnesses guaranteed by the Sixth Amendment . . ."[51] The motion must be supported by memoranda and other points of authority to persuade the court to allow such testimony. Even though the Virginia courts have not formally adopted *Daubert*, such a motion places great importance on the relevance and reliability of scientific evidence, which is the backbone of Virginia's evidence rules concerning scientific expert testimony.

50 Bergman, *supra* note 32, at 16.
51 *Id.*

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BY: STEVEN M. JOHNSON

Although the admissability and reliability of DNA evidence made big headlines during O.J. Simpson's trial just last year, problems surrounding DNA testing were around well before the "trial of the century." The Capital Defense Digest published an article in 1992 on DNA evidence,[1] but advances in technology, literature, case law, and defense tactics in the intervening years warrant another look at DNA evidence.

I. Technological Advances In DNA Analysis[2]

The Polymerase Chain Reaction (PCR) form of DNA testing was first developed by Kary Mullis in 1984.[3] This simple technique revolutionized the study of DNA to such an extent that Ms. Mullis was awarded the Nobel prize in 1994.[4] PCR is generally used when the sample containing DNA is degraded or to small to perform the more accurate RFLP test.[5]

Imagine two Leggos, one red and one white, stuck together. Those Leggos are snapped apart and a new white Leggo attaches to the old red Leggo and a new red Leggo attaches to the old white Leggo. This process repeats over and over, creating millions of paired Leggos. This is essentially how the PCR process is used to replicate DNA.

The most common form of PCR is the DQA1 test. This test is performed by mixing the sample (or template DNA) with the *Taq* DNA Polymerase enzyme, the four DNA building blocks,[6] and DNA probes or primer. This mixture is heated to separate the template DNA into single strands. As the mixture cools, the primers bind to both strands of the DQA1 gene. The *Taq* DNA Polymerase then recognizes the bond of primer and template as a place to catalyze the making of new DNA, identical to the old DNA.[7] The process is repeated thirty times, creating literally millions of DQA1 genes.[8] The DNA is again separated into two strands, allowing probes to bind with specific sequences present in the newly created (amplified) DNA.[9] Nylon is then pressed against the sample and half the sample (a "dot") attaches to the nylon in a distinct pattern. This pattern can then be compared to the known samples for identification.[10]

Kamrin MacKnight identifies four concerns with PCR testing: "(1) 'Allelic drop-out'; (2) the sensitivity of the test and the potential for contamination; (3) the small number of laboratories conducting the test; and (4) interpretation problems."[11]

"Allelic drop-out" describes a situation where the test procedure preferentially amplifies one of two alleles (various types of each gene) to such an extent that it would appear a heterozygous individual (carrying both a dominant and recessive gene) is homozygous (carrying either both dominant or both recessive genes).[12] Apparently this problem only occurs when the testing temperature drops significantly below 94° Celsius.[13]

Because PCR is such a sensitive test, another possible problem is that contaminating DNA might be present in the sample which would disguise the sample DNA.[14] This problem is of particular concern in criminal cases where a crime scene is not as sterile as a laboratory. Although one possible source of contamination is non-human DNA, the probes in the test system do not recognize, much less amplify non-primate DNA (leaving open the unlikely scenario of contamination by

1 Christopher J. Lonsbury, *The Current State of DNA Evidence*, Capital Defense Digest, Vol. 4, No. 2 p. 11 (1992). Mr. Lonsbury's article focuses on RFLP DNA testing mechanics, probability calculations, case law through early 1992 and some advice for defense counsel.

2 This section is a simplified explanation of the PCR test. *See*, Kamrin T. MacKnight, *The Polymerase Chain Reaction (PCR): The Second Generation of DNA Analysis Methods Takes the Stand*, 9 Santa Clara Computer & High-Tech. L.J. 287 (1993), and Howard Coleman & Eric Swenson, *DNA in the Courtroom* (1994).

3 MacKnight, *supra* note 2, at 300-01.

4 Coleman & Swenson *supra* note 2, at 53.

5 *Id.*

6 Adenine, guanine, thymine and cytosine.

7 Coleman & Swenson, *supra* note 2, at 53.

8 *Id.*

9 MacKnight, *supra* note 2, at 306.

10 *Id.* at 306-307.

11 *Id.* at 314.

12 *Id.*

13 *Id.*

14 *Id.* at 316.

gorilla). Contamination by human sources is also not likely to result in aberrant results, but an FBI study in which contamination was induced did reveal contamination where saliva was mixed with the sample.[15]

The small number of laboratories using PCR is another concern. The small number is attributable to the high cost of starting a PCR lab and training.

The final concern is with the interpretation of the results. MacKnight suggests that, "some witnesses have testified to discrepancies in the reading of the dot blots."[16] The dots on the blot differ in intensity. In the past, if a dot was not intense enough, the test became suspect and led to questions of interpreting the intensity of the dots. This ambiguity has been remedied by a control dot. Now, if the test dot is not as intense as the control dot, the test results are suspect.[17]

II. Current Virginia Law

Generally speaking, DNA evidence, including PCR testing, is admissible in Virginia courts.[18] The Virginia General Assembly enacted § 19.2-270.5 during its 1990 session. It provides:

> In any criminal proceeding, DNA . . . testing shall be deemed to be a reliable scientific technique and the evidence of a DNA profile comparison may be admitted to prove or disprove the identity of any person. This section shall not otherwise limit the introduction of any relevant evidence bearing upon any question at issue before the court.[19]

Michael Satcher challenged this provision in *Satcher v. Commonwealth*,[20] contending that the statute is facially unconstitutional, creating an "evidentiary presumption that impermissibly shifts the burden of proof."[21] The Virginia Supreme Court disagreed, deciding that the language "*may* be admitted" indicates that the evidence should be treated as a reliable scientific technique.[22] The court held that the statute "'merely creates a rule of evidence and does not determine the guilt of the accused,'"[23] and the discretion allowed the trial judge is simply administration of rules of evidence.[24] The Virginia Supreme Court also denied Satcher's claim that the statute is void for vagueness.[25]

Although the Virginia Supreme Court allowed the evidence in *Satcher*, it declined to hold that DNA evidence is admissible under *all* circumstances. Drawing from *Spencer v. Commonwealth*,[26] the Virginia Supreme Court indicated that the trial court can shield the jury from DNA evidence when in a specific case "the evidence is . . . inherently unreliable."[27] Further, the court's opinion demonstrates that evidence may be introduced at trial to refute DNA evidence.[28]

Husske v. Commonwealth, a case which involved an alleged rape, addresses whether the trial court should pay an indigent defendant's costs for an expert to combat the state's DNA evidence.[29] In *Husske*, the trial court refused a motion requesting the appointment of a DNA expert, but, prior to trial, the judge appointed an attorney well versed in DNA analysis as co-counsel. In the first *Husske* opinion, the Virginia court of appeals ruled that *Ake v. Oklahoma*[30] entitled Mr. Husske to a court appointed DNA expert.[31]

In *Ake*, the United States Supreme Court required the state to furnish a defendant with a psychiatric expert when the defendant was indigent and the sanity of the defendant was central to the case; the rationale in *Ake* applies to non-psychiatric experts as well.[32] Applying *Ake*, the panel reasoned that 1) the private interest at stake is uniquely compelling; 2) no undue burden would be placed on the state; and, 3) the significant controversy surrounding DNA evidence made an expert necessary to the defense team.[33]

The Commonwealth was granted an *en banc* hearing.[34] The court, however, deadlocked 4-4, which, under the Court of Appeals procedure, affirmed the **trial** court ruling (*i.e.*, that the defendant was **not** entitled to an *Ake* expert).[35] Neither the one paragraph majority opinion, nor the dissent reveal the court's reasoning. *Husske* is now pending before the Virginia Supreme Court. Although the answer to the *Ake* question is still undecided by Virginia Courts, a motion for the appointment of the expert must be made, both to preserve another issue for appeal and because the trial judge may find an expert warranted under the circumstances, especially in a capital case.

An *Ake* motion is proper whenever the prosecution is relying upon DNA evidence. The state will be using an expert to prove the link between the defendant and the sample. It is necessary that the defendant have an independent expert who can explain the DNA process and to assist in the cross examination of the prosecution expert; the independent expert can also prepare a defense to the DNA evidence. The state's expert is unlikely to help the defendant prepare a case in which the expert's own theories must be refuted. Further, a DNA expert will help the defense in any proceedings prior to trial in which the admissibility of the DNA evidence is at issue. Depriving the defendant of a DNA expert is a denial of due process.[36]

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15 *Id.* at 318.

16 *Id.* at 320.

17 *Id.*

18 *Spencer v. Commonwealth*, 240 Va. 78, 393 S.E.2d 609 (Va. 1990) (*Spencer* IV).

19 Va. Code Ann. § 19.2-270.5 (1995).

20 *Satcher v. Commonwealth*, 244 Va. 220, 421 S.E.2d 821 (Va. 1992).

21 *Id.* at 242, 421 S.E.2d 834.

22 *Id.*

23 *Id.* (quoting *Dooley v. Commonwealth*, 198 Va. 32, 53, 92 S.E.2d 348, 350 (1956)).

24 *Id.*

25 *Id.* at 242, 421 S.E.2d 834-35.

26 *Spencer* IV, 240 Va. 78, 393 S.E.2d 609.

27 *Satcher*, 244 Va. at 244, 421 S.E.2d at 835 (citing *Spencer* IV, 240 Va. at 98, 393 S.E.2d at 621).

28 *Id.* at 243, 421 S.E.2d at 835.

29 *Husske v. Commonwealth*, 19 Va.App. 30, 448 S.E.2d 331 (Va.App. 1994) (*Husske* I).

30 *Ake v. Oklahoma*, 470 U.S. 68 (1985).

31 *Husske* I, 19 Va. at 44-45, 448 S.E.2d at 339.

32 *See, e.g., O'Dell v. Commonwealth*, 234 Va. 672, 685, 364 S.E.2d 491, 498 (1988) (court appointment of forensic expert); *United States v. Patterson*, 724 F.2d 1128 (5th Cir. 1984) (fingerprint specialist); *Barnard v. Henderson*, 514 F.2d 744 (5th Cir. 1975) (firearms expert); *Williams v. Martin*, 618 F.2d 1021 (4th. Cir. 1980) (pathologist); *United States v. Fogarty*, 558 F.Supp. 856 (E.D. Tenn 1982) (handwriting analyst); *Bowan v. Eyman*, 324 F.Supp. 339 (D. Ariz. 1970) (serologist). *See also Thornton v. State*, 255 Ga. 434, 339 S.E.2d 240 (1986) (dental expert); *Patterson v. State*, 238 Ga. 204, 232 S.E.2d 233 (1977) (narcotics analyst).

33 *Husske* I, 19 Va.. at 33-37, 448 S.E.2d at 335-340.

34 *Husske v. Commonwealth*, 21 Va.App. 914, 462 S.E.2d 120 (1995) (*en banc*) (*Husske* II).

35 *Id.*

36 *See, e.g., Dubose v. State* 662 So.2d 1189 (Ala. 1995) (defendant entitled to appointment of a DNA expert).

III. Defense Strategies & Tactics[37]

Defense attorney and law professor Barry Scheck, of O.J. Simpson's "Dream Team" fame, offers seven points to attack DNA admissibility and weight, which incorporate the recommendations of the NRC:[38] 1) differences between application of DNA analysis in diagnostics/ paternity suits and in forensics analysis; 2) collection and handling (lab protocol); 3) the procedure used for identifying patterns; 4) the procedure used for declaring a match; 5) the identification of potential artifacts; 6) the database; and 7) quality assurance.[39]

The differences between application of DNA analysis in diagnostics/paternity and its application in forensics relates to the reliability of the results. Some prosecutors may try to elicit testimony that DNA testing has been used for over fifty years. While this is true, it has only been since the mid-1980s that DNA testing has been used in forensics. Defense attorneys can focus on the differences between the two applications to throw doubt on the reliability of the results.[40]

Lab protocol for DNA testing is not regulated and may be changed by the labs at their will. Scheck states that, "lack of protocol used and tested over time severely limits the verifiable reliability of the SBI's methods and results."[41] Extreme care must be taken to ensure that contamination of the sample does not occur (this is especially true with PCR). If the lab does not have a protocol, or if its protocol does not conform to the NRC's recommendations, the procedure may lead to contamination.

The procedure for identification of patterns is also subject to attack. Controls should be used to avoid inaccuracies and patterns should be analyzed by methods other than sight for accurate measurements. Sight lacks precision and is subject to bias on the part of the tester. "Patterns in suspect and evidence samples must be identified separately and independently."[42] Any violation of this implicates reliability of the match.

The matching procedure is dependent upon the deviation in the position of the bands of DNA. Each laboratory determines its matching rules, but a difference of over two standard deviations is unreliable. Matching also relates to the probability of occurrence. The same matching rule must have been applied to both the database as well as to the forensic sample.

Current DNA testing cannot provide 100% certainty that two samples are exact matches. Scheck states, "a 'match' cannot be interpreted without knowledge of the population frequencies of the patterns at the loci examined."[43] Because the whole world has not been DNA tested, laboratories rely upon databases generated by testing samples of the population. The problem with relying on databases is that the databases may not be large enough. Additionally, the prosecution may use the "product rule" to determine a probability. To illustrate the product rule, imagine there are four matches between particular samples. If the database is made up of 500 people and there is one match at each locus, the product rule would yield the probability of 1 in 62,500,000,000 (1/ 500 * 1/500 * 1/500 *1/500). Professor Scheck argues, however, that,

> [t]he product rule is an inaccurate way to calculate the probability because it wrongly assumes that the matches at each locus are statistically independent of each other. By analogy, if a population sample of Europeans showed that 1 in 10 had blond hair, 1 in 10 had blue eyes, and 1 in 10 had fair skin, it would be wrong to multiply those frequencies together, since those traits tend to occur together in the subpopulation of Nordic people. Among the Nordic people, the frequency of all three traits occurring together may be 1 in 20 rather than 1 in 1,000.[44]

The product rule is also flawed because it assumes that people from different geographic areas intermix freely (known as the Hardy-Weinberg equilibrium). If the suspect is from a small, rural area where the people have been in-breeding for years, the genetic traits will be more common than in the general population.

Use of the ceiling principle is recommended by the NRC, but is not currently used by any laboratory.[45] This principle suggests that the results from several subpopulations should be separated out from the general population and studied closely. "The largest frequency of occurrence of an allele at a given locus in any of these subpopulations, or 5%, whichever is larger, should be the ceiling frequency."[46] Multiplying together the ceiling frequency of each loci will give a more accurate indication of probability. Scheck also believes that the laboratory's error rate should be calculated and entered into the equation for probability.[47]

Independent quality checks should be performed to determine the laboratory's quality assurance. Some laboratories do not perform these, and the NRC opines that "no laboratory should let its results with a new DNA typing method be used in court, unless it has undergone [independent quality checks]."[48]

A defense attorney should keep in mind that these attacks are relevant to both admissibility *and* weight. As noted above, the Virginia Supreme Court left the door open for DNA evidence to be excluded if there was a showing that the evidence was so tainted the jury should be shielded from it.

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37 National Research Council (U.S.) Committee on DNA Technology in Forensic Science, *DNA Technology in Forensic Science* (1992). This report (NRC report) on DNA evidence has become an invaluable tool for a defense attorney facing DNA evidence.

38 Barry Scheck, *Meeting DNA Evidence*, North Carolina Academy of Trial Lawyers Death Penalty Litigation Seminar (1992).

39 *Id.* at 6-10.

40 *Id.* at 6.

41 *Id.* at 7.

42 *Id.* at 8.

43 *Id.* at 9.

44 *Id.*

45 *Id.* at 10.

46 *Id.*

47 *Id.*

48 *Id.* at 10 (quoting NRC report *supra* note 37 at 2-5, 6).