

No. CR6-481390

STATE OF CONNECTICUT            )        SUPERIOR COURT  
v.    )        NEW HAVEN JUDICIAL DISTRICT  
EDWARD R. GRANT                    )        APRIL 9 , 2002

MEMORANDUM OF DECISION

RE MOTION TO PRECLUDE EVIDENCE RE: RELEVANCY

AND LACK OF SUFFICIENT CHAIN OF CUSTODY (No. 57)

AND DEFENDANT’S MOTION TO PRECLUDE ALL EVIDENCE RELATING

TO STR/DNA TESTING CONDUCTED AT THE CONNECTICUT

STATE FORENSIC LABORATORY (No. 74)

The principle question presented by the motions now before the court is whether forensic DNA evidence obtained by a technique involving amplification of loci containing Short Tandem Repeats (the “STR” technique) is admissible. For the reasons set forth below, the answer to this question is in the affirmative.

**I. FINDINGS**

The factual backdrop of these motions has been discussed in a number of prior decisions. On July 16, 1973, the body of Concetta (“Penny”) Serra was found in a stairway of the Temple Street parking garage in New Haven. The medical examiner determined that she died as the result of a stab wound to the heart. No one was apprehended at the scene. There was, however, a substantial amount of blood at the scene, and some of this blood is thought to be that of the killer. (Serra’s blood was Type A; the blood thought to be that of the perpetrator is Type O.) Edward Grant, the defendant herein, was arrested for Serra’s murder in 1999, largely on the basis of the

State's allegation that the blood found at the scene is consistent with a DNA profile of Grant's blood.

Grant, who is about to be tried, understandably wishes to exclude the DNA evidence that the State seeks to introduce. On January 4, 2002, he filed a motion to preclude evidence because of an assertedly insufficient chain of custody. (No. 57.) On February 4, 2002, he filed a separate motion to preclude all evidence relating to STR testing. (No. 74.) The motions were the subject of evidentiary hearings held over the course of several days in January and February 2002. Numerous witnesses testified at the chain of custody hearing. The sole witness at the STR hearing was Dr. Carll Ladd, the supervisor of the forensic biology unit of the State Forensic Science Laboratory ("Laboratory"). The motions were argued on April 5, 2002.

Although the chain of custody motion facially seeks exclusion of numerous items of evidence, Grant has narrowed its scope considerably in his post-hearing briefs. He presently seeks to exclude only "Item 6" (a handkerchief found at the crime scene) and "Item 12" (blood on tape lifts taken from inside an automobile belonging to John Serra, also found at the crime scene). The evidentiary importance of these items is primarily related to scientific testing that has been performed on them.

Grant has not complained, at least for purposes of these motions, of the scientific testing performed on "Item 12" (some of which has been actually favorable to him in that it has potentially implicated a third party suspect). In this context, it is difficult to know what to make of his chain of custody attack on that item. Given the fact that the evidentiary importance of "Item 12" consists of the traces of blood that it preserves, the test is whether "there is a 'reasonable probability' that the substance has not been changed in important respects." *State v. Nieves*, 186

Conn. 26, 31 n. 4, 438 A.2d 1183 (1982). After a full consideration of all of the evidence surrounding “Item 12's” preservation and custody and the lack of any likelihood of tampering with that item by intermeddlers, the court determines that the State has met its burden of showing an appropriate chain of custody with respect to that item.

The State has met its burden of showing an appropriate chain of custody with respect to “Item 6” as well. The evidence shows appropriate preservation and custody of that item, and there is no possibility that intermeddlers somehow tampered with that item to contaminate it with material containing Grant’s DNA. The only real question with respect to “Item 6” is whether the handling of that item by a variety of testers over the years has compromised the DNA material remaining on that item to the point where the State’s DNA testing can no longer be considered reliable. After a full consideration of all of the evidence, the court is convinced that the answer to this question is no. Grant’s factual assertions involving contamination and degradation of the DNA material on “Item 6” go to the weight rather than the admissibility of the evidence.

Grant’s arguments involving the STR testing on “Item 6” must now be considered in detail. As mentioned, the sole witness on this issue was Dr. Carll Ladd. Ladd, a Ph.D. in genetics, was a thoroughly credible witness. His testimony displayed command of the subject matter and a thorough professionalism. After setting forth his qualifications, Ladd testified about DNA generally and the STR technique in particular. DNA is an acronym for deoxyribonucleic acid. It is the genetic material of living organisms. In practical terms, DNA is a forensic tool to include or exclude an individual as a potential source of biological evidence.

DNA is primarily located in the nucleus of the cell. It is organized into long thread-like structures called chromosomes. Humans have 46 chromosomes - 23 derived from the father and

23 derived from the mother. The DNA molecule, as is now well known, is a type of ladder forming a double-stranded helix. The rungs of the ladder are the informational content of the molecule. The four individual building blocks of this ladder are called nucleotides, and they are known to scientists as A, C, T, and G. The informational content of the DNA molecule comes from the linear arrangement of these four nucleotides.

Most DNA is the same from person to person. We all share the same basic human structure. But small portions of the DNA, known as hypervariable regions, vary from person to person, and forensic examiners focus on those regions. Except for identical twins, no two persons will have identical DNA profiles.

The Laboratory's general method of DNA typing is Polymerase Chain Reaction ("PCR"). Dr. Ladd referred to the PCR method as "molecular Xeroxing." PCR takes a small amount of DNA and copies it in a process known as amplification. Hypothetically, the method allows a scientist to take a single DNA molecule and create 10 million exact copies. Dr. Ladd's testimony is consistent with the description of the PCR process set forth in *State v. Pappas*, 256 Conn. 854, 869, 776 A.2d 1091 (2001).

The STR technique is, in Dr. Ladd's words, "[t]he latest generation of PCR tests." STR, as mentioned, is an acronym for Short Tandem Repeat. There are certain regions, or loci, of the DNA where multiple copies of identical DNA sequence are arranged in direct succession. In those loci the four nucleotides are repeated one after another, in tandem. The repeats in these loci distinguish one person from another.

The initial task of the forensic scientist seeking to identify the contributor or source of biological material - such as a bloodstain found at a murder site - is to extract the DNA from the

sample in question. The PCR amplification process is then used to generate enough material to detect the DNA profile of that sample.

Most genes exist in multiple forms called alleles. When the STR technique is employed, the alleles are separated through a process known as electrophoresis - involving the application of an electric current to a gel containing the DNA in question - so that the individual components of the DNA can be determined. For these purposes, the Laboratory uses two commercial kits, named (by their manufacturer) Profiler Plus and Cofiler. Profiler Plus, the most widely used STR kit in the United States, amplifies nine STRs plus gender. Cofiler amplifies six STRs. There is some overlap because two STRs are amplified by both kits. Use of both kits amplifies a total of thirteen STRs plus gender. In addition, the overlap serves as a quality control.

The STRs in the evidentiary sample - here the bloodstains found at the murder scene - are compared with the STRs of the suspect. (In this case, a sample of Grant's blood was seized pursuant to a search warrant.) Many suspects are definitively excluded by this process. Nationally, this happens in about one-quarter to one-third of the cases in which this analysis is used. In some cases, the evidentiary sample is so degraded or contaminated that no reliable result can be obtained. In still other cases, there is a genetic match. Degradation or contamination of the evidentiary material may preclude the detection of a result, but these factors will not result in a false match. No amount of degradation or contamination will change one person's DNA profile into another's.

What happens when a match is achieved? National guidelines permit the positive identification of the matching suspect as the source or contributor of the evidentiary sample. The Laboratory is more conservative and merely calculates the probability of a coincidental match in

the general population. Another way of looking at this is that the Laboratory calculates the expected frequency of two individuals having the same genetic profile as the evidentiary sample.

In this case, the Laboratory used the STR technique to examine genetic material taken from five different cuttings of a bloodstained handkerchief (Ex. 6) found near the scene of the crime. Grant was not excluded as the source of genetic material on any of the cuttings. Some cuttings yielded more usable genetic material than others. In the case of the most usable cutting (item#6-1G4), the results of the Laboratory's testing were consistent with Grant being the source of the DNA profile of the genetic material found on that cutting. The expected frequency of individuals who could be the source of that DNA profile is less than 1 in 300 million in the African American, Caucasian, and Hispanic populations. This is the principal result that the State seeks to place into evidence and that Grant seeks to exclude.

The Laboratory takes extensive precautions to avoid contamination of evidentiary samples within its facilities. It also uses a series of controls to ensure the validity of its results. Four controls are used with every set of experimental samples that it tests. Two are negative controls, involving reagents with no DNA added. (These are primarily used to detect contamination.) Two are positive controls, involving DNA of a known source. One positive control is provided by the manufacturer of the kit. The second is provided by a Laboratory employee. Each Laboratory analyst takes two commercially prepared proficiency tests per year. In addition, the Laboratory is periodically subjected to double blind testing by external testers. The Laboratory has never been notified that it has made a mistake.

The National Research Council ("NRC") of the National Academy of Sciences has endorsed the STR method as "[o]ne of the most promising of the newer [DNA] techniques."

NATIONAL RESEARCH COUNCIL, THE EVALUATION OF FORENSIC DNA EVIDENCE 23 (1996). The 1996 report just cited affirms the conclusion of the NRC's 1992 report that, "[T]he molecular technology is thoroughly sound and ... the results are highly reproducible when appropriate quality control methods are followed." *Id.* (Prior to the 1996 report, the 1992 report was recognized as authoritative by *State v. Sivri*, 231 Conn. 115, 158-59, 646 A.2d 169 (1994).) STR technology has been validated by numerous articles, authored by Dr. Ladd and other trained professionals, in peer-review publication. Additional validation work is likely to be published in the future.

STR results have been presented in Connecticut courts approximately 44 times, apparently without challenge. (Cases from other jurisdictions are discussed later in this opinion.) The Laboratory has additionally used the technique on approximately 750 cases not yet presented in court. The Laboratory has also used the STR technique to analyze blood samples obtained from approximately 5,000 sexual offenders pursuant to Conn. Gen. Stat. § 54-102g.

## **II. DISCUSSION**

In *State v. Porter*, 241 Conn. 57, 698 A.2d 739 (1997), *cert. denied*, 523 U.S. 1058 (1998), our Supreme Court adopted the test for the admissibility of scientific evidence set forth in *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579, 592-93 (1993). *Porter* holds that, "A trial judge should ... deem scientific evidence inadmissible only when the methodology underlying such evidence is sufficiently invalid to render the evidence incapable of helping the fact finder determine a fact in dispute. ... [A] sufficient showing of validity is necessary for scientific evidence to be helpful." 241 Conn. at 89. Code of Evidence § 7-2, adopted after *Porter* was decided, is consistent with this principle. *See* Commentary to § 7-2. In an important footnote,

*Porter* explains that, “Once the validity of a scientific principle has been satisfactorily established, any remaining questions regarding the manner in which that technique was *applied* in a particular case is generally an issue of fact that goes to weight, and not admissibility.” 241 Conn. at 88 n.

31. (Emphasis in original.)

“Several factors properly may play a role in a court’s assessment of the validity of a scientific methodology.” *State v. Pappas, supra*, 256 Conn. at 876. *Pappas* summarizes these factors as follows:

These factors are not exclusive. Some will not be relevant in particular cases; and some cases will call for other considerations. ... Courts should ... consider whether a scientific principle has gained general acceptance in making admissibility determinations. ... Although general acceptance is no longer an absolute prerequisite to the admission of scientific evidence, it should, in fact, be an important factor in a trial judge’s assessment. ... That is, if a trial court determines that a scientific methodology has gained general acceptance, then the *Daubert* inquiry will generally end and the conclusions derived from that methodology will generally be admissible. If a principle has not gained general acceptance ... a proponent of the scientific opinion ... may still demonstrate the reliability or validity of the underlying scientific theory or process by some other means, that is, without establishing general acceptance. ...

The trial court ... may also consider the following factors: (1) whether the theory or technique can be, and has been, tested; (2) whether it has been subjected to peer review and publication; and (3) the known or potential rate of error, including the existence and maintenance of standards controlling the technique’s operation. ... Furthermore ... the prestige and background of the expert witness supporting the evidence can play a role in determining whether a novel technique employed by that individual is likely to have any scientific merit. ... The extent to which the scientific technique in question relies on subjective interpretations and judgments by the testifying expert, rather than on objectively verifiable criteria, can also be a factor. ... Courts may also consider whether a testifying expert can present and explain the data and methodology underlying his or her scientific testimony in such a manner that the fact finder can reasonably and realistically draw its own conclusions therefrom ... and whether the scientific technique underlying the proffered expert testimony was developed and implemented solely to develop evidence for in-court use, or whether the technique has been developed and used for extrajudicial purposes.

*Id.* at 876-77. (Internal brackets and quotation marks and citations omitted.)

Our Supreme Court has stated that, “[T]he basic procedures employed [in analyzing nuclear DNA evidence], both in theory and in laboratory practice, repeatedly have been recognized as generally accepted in the scientific community.” *State v. Sivri, supra*, 231 Conn. at 153-154. It restated this understanding, again by way of dictum, in *Pappas*. 256 Conn. at 878. Although the judicial observations just cited were technically made in dicta, I do not understand Grant to challenge them. Indeed, nuclear DNA evidence is so generally accepted at the present time by advocates on all sides of the criminal justice system that a successful challenge to the general methodology of DNA testing would be unlikely in the extreme.

*Pappas* holds that mitochondrial DNA (“mtDNA”) evidence satisfies the validity requirement of *Porter*. 256 Conn. at 880-81. Although mtDNA “differs from nuclear DNA with respect to its location within a cell, its uniqueness among individuals, sequence length and its mode of inheritance,” *id.* at 867, the scientific process of developing mtDNA evidence resembles the procedure used to develop nuclear DNA evidence in important respects. *Pappas* finds that, “[T]he procedures used to extract and chart the chemical bases of mtDNA - extraction, PCR amplification, capillary electrophoresis, and the use of an automated sequencing machine to generate a chromatograph - are scientifically valid and generally accepted in the scientific community.” *Id.* at 880. It additionally concludes that, “[I]ssues regarding contamination are important and may bear on the weight of mtDNA evidence in a particular case ... but those issues do not undermine the admissibility of the results of the mtDNA sequencing process used in [*Pappas*].” *Id.* at 881.

The credible scientific evidence presented in the present case makes it clear that the

observations of *Pappas* are applicable to the nuclear DNA evidence developed by the Laboratory here. The Laboratory's procedure of extraction is the same as the extraction procedure used in mtDNA analysis. The PCR amplification used by the Laboratory in its STR analysis is generally the same as that used in mtDNA analysis, although different DNA is amplified. The Laboratory's procedure in electrophoresis is similar to the process of capillary electrophoresis used in mtDNA analysis. A different machine is used, but both machines separate alleles by size. The automated sequencing machine used in mtDNA analysis is not used by the Laboratory in its STR analysis, although both procedures can be done on the same equipment. Issues involving contamination may go to the weight of the particular evidence, but those issues do not undermine the admissibility of evidence based on STR analysis. The general scientific principles underlying STR analysis and mtDNA analysis are identical. The principles of STR analysis are scientifically valid and generally accepted in the scientific community.

Although the STR technique is of relatively recent vintage and has not been considered in any discovered Connecticut decision, it has already found broad acceptance in our nation's courts. Beginning with *Commonwealth v. Rosier*, 685 N.E.2d 739 (Mass. 1997), numerous appellate courts have held STR evidence to be legally admissible. Three state courts of highest jurisdiction have held that the STR technique satisfies the *Daubert* test of scientific validity used in those states. *People v. Shreck*, 22 P.3d 68, 80 (Colo. 2001); *Commonwealth v. Rosier*, *supra*, 685 N.E.2d at 743; *State v. Butterfield*, 27 P.3d 1133, 1143 (Utah 2001). A fourth state court of highest jurisdiction has held that the STR technique satisfies the "general acceptance" test - famously promulgated in *Frye v. United States*, 293 F. 1013 (D.C. Cir. 1923) - used in that state. *State v. Jackson*, 582 N.W.2d 317, 325 (Neb. 1998). Intermediate state courts of appeal in two

other states, including several in California, have also reached this conclusion using the *Frye* test. *People v. Brown*, 110 Cal. Rptr. 750, 762 (Cal. Ct. App. 2001); *People v. Hill*, 107 Cal. Rptr. 110, 119 (Cal. Ct. App. 2001); *People v. Allen*, 85 Cal. Rptr. 655, 660 (Cal. Ct. App. 1999); *Lemour v. State*, 802 So.2d 402, 405 (Fla. Dist. Ct. App. 2001). Two exceptionally thorough published trial court opinions have reached this conclusion as well. *United States v. Trala*, 162 F.Supp. 336 (D. Del. 2001) (using *Daubert*); *People v. Owens*, 725 N.Y.S.2d 178 (N.Y. Sup. Ct. 2001) (using *Frye*).

Widespread appellate endorsement of a scientific technique should ordinarily end the need for case-by-case adjudication in the trial courts. *People v. Allen, supra*, 85 Cal. Rptr. at 659. Scientific research is a national - or global - phenomenon, and there is no need for a court in one state to disregard the judicial decisions of other jurisdictions. *Id.* While a single appellate decision in one state does not automatically settle the issue, at some point the combined weight of judicial and scientific opinion achieves the critical mass of persuasive authority. With respect to STR evidence - at least in the absence of evidence reflecting a change in scientific consensus - that point has now been reached. There is overwhelming evidence that the STR technique has gained general acceptance. This conclusion should end the court's inquiry, and the conclusions derived from that methodology should be held admissible. *State v. Pappas, supra*, 256 Conn. at 876.

In the event that a reviewing court should disagree with this conclusion, the remaining factors identified by *Pappas* - *see* 256 Conn at 877 - will briefly be considered. The court makes the following additional findings.

(1) The STR technique has been repeatedly tested, both by the Laboratory and by other scientific researchers and has just as repeatedly been found reliable.

(2) The technique has repeatedly been subjected to peer review and publication.

(3) The known or potential rate of error is low to nonexistent when the technique is properly employed.

(4) Strict, well-defined standards govern the technique's operation.

(5) The prestige and background of Ladd, the expert witness supporting the evidence, is impressive.

(6) The technique in question relies on objectively verifiable criteria rather than subjective interpretations and judgments by the testifying expert. Professional experience and judgment are used in the analysis, but this is frequently the case with respect to scientific evidence. (As the State points out, the acceptance of X-ray technology is well established, but experts can nevertheless disagree about the meaning of a particular X-ray image.) STR analysis itself is based on objectively verifiable criteria.

(7) Ladd, the testifying expert, can present the data and methodology underlying his scientific testimony in such a manner that the factfinder can reasonably and realistically draw its own conclusions therefrom.

(8) The technique was originally developed for research purposes rather than for in-court use. It is now used for a multitude of purposes, including sexual offender data bases and the identification of human remains (as in the aftermath of the World Trade Center attack), in addition to in-court testimony.

Given these specific findings, the court concludes that the STR technique used by the Laboratory is valid. It is admissible under Code of Evidence § 7-2 and the *Daubert/Porter* test. The court cannot find that its probative value is outweighed by undue prejudice.

Grant has voiced numerous perceived problems with the application of STR technology to his particular case. As mentioned, however, “[o]nce the validity of a scientific principle has been satisfactorily established, any remaining questions regarding the manner in which that technique was *applied* in a particular case is generally an issue of fact that goes to weight, and not admissibility.” *State v. Porter, supra*, 241 Conn. at 88 n. 31. (Emphasis in original.)

Grant’s motions to preclude evidence because of an assertedly insufficient chain of custody and because of the asserted unreliability of STR testing are denied.

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Jon C. Blue  
Judge of the Superior Court