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The State of Ohio, Appellee, v. Pierce, Appellant.

[Cite as State v. Pierce (1992), Ohio St.3d .]

Evidence -- DNA evidence -- Admissible but subject to judicial analysis for prejudice -- Questions regarding reliability of DNA evidence go to the weight of the evidence rather than to its admissibility.

1. DNA evidence may be relevant evidence which will assist the trier of fact in determining a fact in issue, and may be admissible. (State v. Williams [1983], 4 Ohio St.3d 53, 4 OBR 144, 446 N.E.2d 444, syllabus, applied.)
2. Questions regarding the reliability of DNA evidence in a given case go to the weight of the evidence rather than to its admissibility.

(No. 90-1898 -- Submitted June 2, 1992 -- Decided September 2, 1992.)

Appeal from the Court of Appeals for Delaware County, No. 89-CA-30.

On January 4, 1988, a vocational high school student in Delaware, Ohio, was raped at knife point while on her way to school. A rape sex crime kit was performed, which included samples of evidence taken from the victim at the hospital. The victim described her assailant as an individual who was half-black and half-white. However, she did not get a good look at his face and, because he was wearing a hat, she was unable to estimate the length of his hair. The victim did not identify the appellant, Louis Pierce, Jr., from two photo arrays -- one shown in January 1988 shortly after she was raped and the other shown in May 1988. However, she did identify Pierce as the man who raped her when she later saw him in the hallway of the courthouse at a pretrial hearing the day before the trial began and again at trial.

On May 2, 1988, a high school student was raped at knife point by a masked man while she was sunbathing at Delaware State Park. The second victim identified Pierce from a photo array, and specifically from his eyes, nose, and freckles. A rape kit was completed at the hospital, which included samples of evidence obtained from the victim. The victim's friend, who was with her and whose money was taken by the man, described the assailant as being light-complected, and that he had

freckles. The friend also identified Pierce from a photo array.

On June 6, 1988, a third victim was accosted by a man on a street in Delaware, whom she later identified at the trial as Pierce. The victim testified that Pierce ordered her to walk a certain way because "I have got a gun," and ordered her to shut up, stating, "I have a gun." When the victim resisted the offender, he continued to pull on her saying, "I have got a gun." The victim struck Pierce with her keys and was able to break away from Pierce when his girlfriend and another woman drove up.

Thereafter, Pierce was indicted on one count of rape and one count of aggravated robbery for the crimes committed on May 2, 1988 at Delaware State Park; on one count of kidnapping for the incident on June 6, 1988; and on one count of rape for the crime committed on January 4, 1988. The charges were thereafter consolidated into one case. Blood was drawn from Pierce for purposes of DNA testing while he was in jail. Pierce's blood samples and the samples from the victim's rape kits were sent to Cellmark Diagnostics ("Cellmark") of Germantown, Maryland.

Pierce's trial counsel filed a motion to suppress any DNA evidence that the prosecution sought to present at trial. The motion stated that Pierce had requested discovery of all documents the prosecution intended to be "produced." The motion further stated that Pierce did not have a copy of any document showing the manner in which the DNA testing was conducted, which would prevent Pierce from being able to properly cross-examine the state's expert witnesses on DNA testing. The state filed supplemental discovery providing Pierce with copies of charts describing the DNA testing procedure used and copies of the autoradiograms, the graphic record obtained by exposing DNA samples to X-ray film and then developing it.

At a hearing on the motion to suppress, counsel argued the issue of whether the standard of admissibility with respect to DNA evidence was that found in *Frye v. United States* (C.A.D.C. 1923), 293 F. 1013, or that of relevancy, under which objections to such evidence go to weight rather than admissibility. Pierce's trial counsel argued that DNA forensic evidence has not been accepted by the scientific community and that because no standards or guidelines have been promulgated regarding the usage of DNA evidence, such evidence is unreliable. The court overruled the motion, concluding the evidence should be admitted, with the jury to determine its weight and reliability. Trial began the same day. Pierce was convicted on the two counts of rape and one count of kidnapping. He was found not guilty of aggravated robbery. The court of appeals affirmed Pierce's conviction.

The cause is now before this court pursuant to the allowance of a motion for leave to appeal.

W. Duncan Whitney, Prosecuting Attorney, and George E. Lord, for appellee.

Randall M. Dana, Ohio Public Defender, Richard E. Graham, Gloria Eyerly and Timi J. Townsend, for appellant.

Lee I. Fisher, Attorney General, Simon B. Karas, Jeffery W. Clark and Barbara J. Petrella, urging affirmance for amicus

curiae, Ohio Attorney General.

Moyer, C.J. In this appeal, we are presented with important issues relating to the admissibility of DNA evidence in a criminal prosecution.¹ For the following reasons, we hold that such evidence may be admissible and that questions regarding the reliability of such evidence go to its weight rather than its admissibility.

I

The Scientific Background of DNA Evidence

DNA is the common abbreviation for deoxyribonucleic acid. DNA is the "fundamental natural material which determines the genetic characteristics of all life forms." *People v. Castro* (Sup.Ct. 1989), 144 Misc.2d 956, 961, 545 N.Y.S.2d 985, 988. It is responsible for determining individual human characteristics, such as hair color and eye color which differentiate humans. Except for identical twins, no two individuals have the same DNA. *Id.* at 962, 545 N.Y.S.2d at 988.

The Missouri Supreme Court in *State v. Davis* (Mo. 1991), 814 S.W.2d 593, 598, certiorari denied (1992), 502 U.S. , 112 S.Ct. 911, 116 L.Ed.2d 812, gave the following explanation of DNA:

"Most human cells contain a nucleus which in turn contains 46 chromosomes that arrange themselves in pairs. Tightly coiled and packaged within these chromosomes are DNA strands consisting of two strands of nucleotides running in opposite directions. The double helix strands of DNA are connected by hydrogen bonds between bases. There are only four varieties of bases (Adenine, Thymine, Guanine, and Cytosine, which are more commonly referred to as A, T, G, C) and these form only two varieties of pairs (A and T, G and C).

"A gene is a segment of DNA that determines physical characteristics such as hair and eye color as well as genetic defects such as Huntington's disease. There is also a certain quantity of DNA which apparently provides no code for characteristics and this is referred to as 'space' or 'junk' DNA. A DNA molecule contains more than 3 billion units and although a human receives half of his DNA composition from his mother and half from his father, the final links of DNA are unique to each individual."

The DNA testing procedure used by Cellmark in this case, the Restriction Fragment Length Polymorphism procedure, is a six-step procedure. The court in *Davis*, *supra*, gave the following explanation of the procedure:

"1) Extraction. The DNA is chemically extracted from the blood sample and purified to obtain a high molecular DNA.

"2) Fragmentation. The DNA molecule, too large to deal with as a single unit, is then cut into fragments by a restricting enzyme which, depending upon the enzyme selected, cuts the DNA fragment precisely at a designated point.

"3) Electrophoresis. The DNA fragments are then placed in an agarose gel between two electrically charged poles which assist in separating the fragments by size, the smaller fragments more readily through the gel than the large. The end result is an orderly pattern of the fragments in parallel lines.

"4) Southern Blotting. Named for Dr. Ed Southern who pioneered the process in the mid-1970s, the DNA band pattern in

the agarose gel is then transferred to a nylon membrane which resembles a sheet of heavy blotting paper. During this process, the DNA strands are 'unzipped' from one another at their base pairings.

"5) Hybridization. Radioactive tagged probes, which are small DNA fragments developed in the laboratory, are then introduced onto the nylon membrane. The probes locate and attach themselves to recognized complementary base sequences, in essence 'zipping' back parts of the DNA fragments.

"6) Autoradiograph. The excess probes are washed away and the nylon membrane is then placed next to a sheet of x-ray film and is exposed for several days. The end product is a series of dark parallel bands resembling the Universal Bar Codes on labels commonly found in retail stores to identify stacks of merchandise. The result is known as an autoradiograph or commonly an autorad. This then is the DNA fingerprint." Id. at 598-599.

II

Legal Standard for the Admissibility of DNA Evidence

A number of federal and state courts have considered the admissibility of DNA evidence. A majority of those courts have held that such evidence is admissible. *United States v. Jakobetz* (C.A.2, 1992), 955 F.2d 786, petition for certiorari filed (Apr. 8, 1992), U.S.Sup.Ct. case No. 91-7921; *Martinez v. State* (Fla.App.1989), 549 So.2d 694; *Andrews v. State* (Fla.App.1988), 533 So.2d 841, review denied (Fla.1989), 542 So.2d 1332; *Caldwell v. State* (1990), 260 Ga. 278, 393 S.E.2d 436; *People v. Thomas* (1990), 137 Ill.2d 500, 148 Ill.Dec. 751, 561 N.E.2d 57, certiorari denied (1991), 498 U.S. , 111 S.Ct. 1092, 112 L.Ed.2d 1196; *Smith v. Deppish* (1991), 248 Kan. 217, 807 P.2d 144; *Cobey v. State* (1989), 80 Md.App. 31, 559 A.2d 391, certiorari denied (1989), 317 Md. 542, 565 A.2d 670; *People v. Shi Fu Huang* (Cty.Ct. 1989), 145 Misc.2d 513, 546 N.Y.S.2d 920; *State v. Pennington* (1990), 327 N.C. 89, 393 S.E.2d 847; *State v. Ford* (1990), 301 S.C. 485, 392 S.E.2d 781; *Smith v. Wimberly* (S.D.1991), 49 Crim.L.Rep. 1016; *Glover v. State* (Tex.Crim.App.1992), 825 S.W.2d 127; *Spencer v. Commonwealth* (1990), 240 Va. 78, 393 S.E.2d 609, certiorari denied (1990), 498 U.S. , 111 S.Ct. 281, 112 L.Ed.2d 235; *Spencer v. Commonwealth* (1989), 238 Va. 275, 384 S.E.2d 775, certiorari denied (1990), 493 U.S. 1036, 110 S.Ct. 759, 107 L.Ed.2d 775; *Spencer v. Commonwealth* (1989), 238 Va. 295, 384 S.E.2d 785, certiorari denied (1990), 493 U.S. 1093, 110 S.Ct. 1171, 107 L.Ed.2d 1073; *State v. Woodall* (1989), 182 W.Va. 15, 385 S.E.2d 253.2

In fact, as of 1990, DNA evidence had been admitted or used to obtain a plea in one hundred eighty-three cases in thirty-eight states. U.S. Congress, Office of Technology Assessment, *Genetic Witness: Forensic Uses of DNA Tests* (1990) 15. However, it is readily apparent from a review of those cases that jurisdictions differ on what standard should be used in determining the admissibility of scientific evidence.

Pierce urges this court to adopt the test promulgated by the United States Court of Appeals for the District of Columbia Circuit in *Frye v. United States* (C.A.D.C. 1923), 293 F. 1013, in order to determine whether DNA typing evidence may be admitted. The Frye court was faced with the issue of whether

to admit new or novel scientific evidence. A determination must be made as to when "a scientific principle or discovery crosses the line between the experimental and demonstrable stages * * *." *Id.* at 1014. The court in *Frye* concluded that for scientific evidence to be admissible, the underlying scientific principle "must be sufficiently established to have gained general acceptance in the particular field in which it belongs." *Id.*

By urging us to adopt the *Frye* test for the admissibility of DNA evidence, *Pierce* is asking us to reject the relevancy standard for the admission of scientific evidence recognized by this court in *State v. Williams* (1983), 4 Ohio St.3d 53, 4 OBR 144, 446 N.E.2d 444, syllabus. Under the standard adopted in *Williams*, the admissibility of scientific evidence in Ohio is governed by Evid.R. 402, 403, and 702. *Id.*, 4 Ohio St.3d at 57-58, 4 OBR at 148, 446 N.E.2d at 447. Evid. R. 402 provides:

"All relevant evidence is admissible, except as otherwise provided by the Constitution of the United States, by the Constitution of the State of Ohio, by statute enacted by the General Assembly not in conflict with a rule of the Supreme Court of Ohio, by these rules, or by other rules prescribed by the Supreme Court of Ohio. Evidence which is not relevant is not admissible."

However, Evid.R. 403(A) mandates the exclusion of relevant evidence if its probative value is outweighed by danger of unfair prejudice, confusion of the issues, or misleading the jury. *State v. Williams*, *supra*, at 58, 4 OBR at 148, 446 N.E.2d at 447. Finally, Evid.R. 702 provides:

"If scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in 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."

This court in *Williams* rejected the *Frye* standard, preferring a more flexible approach. "The 'Frye test' has been criticized * * * by courts and commentators alike." *State v. Williams*, *supra*, at 57, 4 OBR at 147, 446 N.E.2d at 447. "Like our counterpart in Maine, we refuse to engage in scientific nose-counting for the purpose of deciding whether evidence based on newly ascertained or applied scientific principles is admissible. We believe the Rules of Evidence establish adequate preconditions for admissibility of expert testimony, and we leave to the discretion of this state's judiciary, on a case by case basis, to decide whether the questioned testimony is relevant and will assist the trier of fact to understand the evidence or to determine a fact in issue." *Id.* at 58, 4 OBR at 148, 446 N.E.2d at 448.

"The relevancy standard balances the probativeness, materiality, and reliability of the evidence against the risk of misleading or confusing the jury or unfairly prejudicing the defendant. This approach makes all expert testimony on generally recognized tests presumptively admissible and places the burden of excluding the evidence on the opponent." *Case Note, United States v. Two Bulls: Eighth Circuit Addresses Admissibility of Forensic DNA Evidence* (1991), 37 *Loyola L.Rev.* 173, 177.

The United States Court of Appeals for the Second Circuit

also recently rejected an invitation to adopt the Frye standard. *United States v. Jakobetz*, supra. The court stated:

"Although we realize that DNA evidence does present special challenges, we do not think that they are so special as to require a new standard of admissibility. Despite the difficulties involved in cases with novel, complex and confusing evidence, the jury must retain its fact-finding function." *Id.*, 955 F.2d at 796.

Pierce cites several decisions for the proposition that DNA evidence should not be admissible: *Commonwealth v. Curnin* (1991), 409 Mass. 218, 565 N.E.2d 440; *State v. Schwartz* (Minn.1989), 447 N.W.2d 422; *United States v. Two Bulls* (C.A.8, 1990), 918 F.2d 56. However, in each of these cases, the courts examined the admissibility of DNA evidence under the Frye test and specifically held that DNA test results are admissible when such tests are performed with appropriate laboratory standards and controls. In each of these cases, however, the prosecution failed to establish a sufficient foundation for the DNA evidence. As will be discussed below, such is not the case here. Additionally, the United States Court of Appeals for the Eighth Circuit granted rehearing en banc in *United States v. Two Bulls*, but the rehearing was vacated and the appeal dismissed on the death of the defendant *Two Bulls*. See 925 F.2d 1127.

The standard for the admissibility of scientific evidence in Ohio as found in *State v. Williams* is whether the questioned evidence is relevant and will assist the trier of fact in understanding evidence presented or in determining a fact in issue. Pierce has not advanced any argument which would justify the use of a standard for the admissibility of DNA evidence different from that used in determining the admissibility of other scientific or technical evidence. DNA evidence may be relevant evidence which will assist the trier of fact in determining a fact in issue, and may be admissible, subject to a judicial analysis for prejudice. Any rebuttal evidence goes to weight rather than admissibility. We, therefore, hold that the trial court did not abuse its discretion in admitting the DNA evidence in this case.

Although irrelevant for the determination of admissibility under Ohio law, the theory and procedures used in DNA typing are generally accepted within the scientific community. "[F]orensic uses of DNA tests are both reliable and valid when properly performed and analyzed by skilled personnel." (Bold-face type deleted.) *Genetic Witness: Forensic Uses of DNA Tests*, supra, at 7-8. The National Research Council's Committee on DNA Technology in Forensic Science also recently concluded that the procedures for measuring differences in DNA samples are "fundamentally sound." National Research Council, *DNA Technology in Forensic Science* (1992) S-24.

III

The Reliability of the DNA Evidence in this Case

On appeal, Pierce does not challenge the underlying scientific principles involved in the testing procedures used by Cellmark in this case. Rather, he attacks the reliability of the actual procedures used and analysis of the results of the DNA testing made by Cellmark here. First, Pierce challenges Cellmark's conclusion that there was a match between

the DNA banding patterns of the evidentiary specimens obtained from the rape kits and the pattern of his own blood sample. Pierce notes that the commercial laboratories and the Federal Bureau of Investigation laboratory have developed different rules for concluding that a match between DNA samples has been obtained. See *United States v. Yee* (N.D. Ohio 1991), 134 F.R.D. 161, 180. He concludes that because there is no standard for determining a match, the conclusion that there were matches in this case is suspect.

However, the fact that there are no uniform standards for determining what constitutes a match between DNA patterns does not necessarily mean that Cellmark's determination that the samples matched was erroneous. Dr. Daniel G. Garner, Ph.D., the Director of Laboratories at Cellmark, testified that he reviewed the standard operating procedures used in the DNA testing and that he performed an independent interpretation of the test results, that he evaluated the standards that Cellmark has formulated for DNA testing, and that those standards were followed in analyzing the blood samples in this case. Pierce presented no evidence that Cellmark's standards were deficient. The fact that other laboratories and experts may use somewhat different criteria for determining whether there is a match does not by itself mean that the test results in this case are unreliable. Differences in the opinions of experts are inevitable in the application of science to the law. Without evidence that Cellmark's standards were somehow deficient, we cannot conclude that the laboratory's conclusion was unreliable.

Pierce also argues that false positives may occur in DNA testing. False positives can occur when samples are contaminated, mistakenly mixed or mislabeled. No scientific procedure always produces correct results. Given the human element involved in their design and process, all scientific procedures and analyses have incidents of error. Pierce essentially argues that the test results in this case may be unreliable because the laboratory which conducted the test, Cellmark, has not scored one hundred percent on past proficiency tests in connection with its own DNA analyses.³ However, there was no evidence that the DNA analysis of Pierce's blood sample and of the samples from the rape kits in this case was done incorrectly, or that the test results were misinterpreted or tainted in any way.

Pierce further argues that the use of the chemical ethidium bromide in the typing process makes the results in this case unreliable. Pierce states that ethidium bromide can cause band shifting that can affect both the declaration of the "match" (a potential false positive) and the probability estimate. Pierce also notes that scientists have concluded that ethidium bromide may cause mutations within DNA. Kirby, *DNA Fingerprinting* (1990) 98. However, these arguments were not raised below and no evidence was presented demonstrating that band shifting or mutations occurred. Further, in commenting on the results of DNA testing conducted by the FBI, a testing process and procedure similar to the one used in this case, the court in *People v. Mohit* (Cty. Ct. 1992), 579 N.Y.S.2d 990, 995, stated the following:

"There is no real evidence that the use of EtBr [Ethidium

Bromide] during electrophoresis causes unreliable results. Its use is generally accepted within the scientific community in both theory and practice. To the extent it may cause band shifting, the likelihood of causing a false positive over four probes is extremely unlikely. The possibility of distortions caused by EtBr may properly be argued before a jury, but the possibility of distortion does not affect the admissibility of the laboratory findings."

Pierce also attacks the introduction of evidence regarding the statistical frequency of the occurrence of the same DNA composition in the black population. The statistical frequency was obtained by using a formula based on standard probability theory. The formula involves the multiplication of the individual probabilities for the occurrence of individual alleles (any one of a series of two or more genes) within a DNA sample. This formula is called the product or multiplication rule. The product or multiplication rule was explained in *People v. Wesley* (Cty.Ct.1988), 140 Misc.2d 306, 328-329, 533 N.Y.S.2d 643, 657, fn. 23:

"Assume a population of 10 automobiles, 5 being convertibles and 5 not. The automobiles are numbered but not seen. The probability of selecting a convertible is 1 out of 2.

"Assume that five of the automobiles are colored blue. The probability of selecting a blue automobile is 1 out of 2, and the probability of selecting a blue convertible is 1 out of 4.

"Assume now that only convertibles are colored blue. The probability of selecting a blue convertible reverts back to 1 out of 2.

"Thus, if, for example, four genes were always transmitted together, if these genes were used in an identification test the power of identity achieved would not be a multiple of the four frequencies, but merely the power of identity of one of them."

An alternative explanation of the multiplication rule is found in *State v. Pennell* (Del.Super.Ct.1989), 584 A.2d 513, 5174:

"* * * [A] probability that a DNA with eight identified rare alleles will occur is determined by multiplication of the eight individual probabilities, e.g., $1/a \times 1/b \times 1/c \times 1/d \times 1/e \times 1/f \times 1/g \times 1/h$. It is easy to see that if the probability of each of these alleles occurring is but 1 in 10, the probability of all eight appearing in the same individual is 1 in 108 or 1 in a hundred million. If but two of the alleles occur only in 1 of a hundred individuals, the resulting probability of all eight alleles matching becomes one in ten billion."

Use of this formula is dependent upon two assumptions: that the alleles tested for are not the result of linkage disequilibrium and that the data base population must be in or approach Hardy-Weinberg equilibrium. Linkage disequilibrium is avoided by obtaining alleles from different chromosomes, thereby increasing the probability that the alleles measured occurred randomly rather than as the product of one parent's genetic contribution. "Hardy-Weinberg equilibrium assumes that allele frequencies in the population remain constant from generation to generation so long as there is random mating in

the population. Of course, small deviations from Hardy-Weinberg exist in human communities for a number of reasons, including the fact that human mating is not, in the truest sense, random." *State v. Pennell*, supra, 584 A.2d at 517.

A number of scientists and other commentators have criticized the soundness of these assumptions. Note, *The Dark Side of DNA Profiling: Unreliable Scientific Evidence Meets the Criminal Defendant* (1990), 42 *Stan.L.Rev.* 465, 488-492; Ford & Thompson, *A Question of Identity, Some Reasonable Doubts About DNA "Fingerprints,"* *The Sciences* (Jan./Feb.1990) 37, 42; Neufeld & Colman, *When Science Takes the Witness Stand* (May 1990), 262 *Scientific American* 46, 52; *DNA Technology in Forensic Science*, supra, at 3-1 to 3-25. Specifically, scientists have challenged the assumptions based on their belief that population substructures or subgroups exist in which the alleles of its members may be statistically correlated with one another. Other scientists, while recognizing the possibility or likelihood of population substructures, have concluded that the effect of such substructures on DNA frequencies is minimal. Chakraborty & Kidd, *The Utility of DNA Typing in Forensic Work* (1991), 254 *Science* 1735-1739; Risch & Devlin, *On the Probability of Matching DNA Fingerprints* (1992), 255 *Science* 717-720 (as reported in *DNA Technology in Forensic Science*, supra, at 3-7).

Testimony by two of the state's experts indicated that there was a probability that only one in forty billion blacks would have the same DNA composition as Pierce. On cross-examination, one of the experts admitted that there are only five to six billion people in the world. Further, the witness did not know what percentage of the world's population is composed of blacks. Cross-examination also revealed that the data base for blacks which Cellmark uses in calculating the probability of a DNA sample frequency contains approximately one hundred samples. Thus, the jury was presented with evidence of the alleged defects or limitations of the probability frequency. "The focus of the court must be on 'the admissibility or non-admissibility of a particular type of scientific evidence', not 'the truth or falsity of an alleged scientific "fact" or "truth"'. * * * In other words, the court need not make the initial determination that the expert testimony or the evidence proffered is true before submitting the information to the jury. The court must allow the jury to discharge its duties of weighing the evidence, making credibility determinations, and ultimately deciding the facts." *United States v. Jakobetz*, supra, 955 F.2d at 796-797.

The jury was free to reject the DNA evidence if it concluded that the evidence was unreliable or misleading. Therefore, we conclude that the trial court did not abuse its discretion in admitting the calculations as to the frequency probability, and it was for the jury to determine what weight, if any, to give such evidence.

Moreover, we note that the state did not rely exclusively on the DNA evidence to prove its case. The eyewitness testimony of the victims identified Pierce as being their assailant.

We hold that questions regarding the reliability of DNA

evidence in a given case go to the weight of the evidence rather than its admissibility. No pretrial evidentiary hearing is necessary to determine the reliability of the DNA evidence. The trier of fact, the judge or jury, can determine whether DNA evidence is reliable based on the expert testimony and other evidence presented. "We emphasize, however, that once the court determines admissibility, the jury remains at liberty to reject [the scientific] evidence for any number of reasons, including a view that the * * * [scientific] technique itself is either unreliable or misleading." *State v. Williams*, 4 Ohio St.3d at 59, 4 OBR at 149, 446 N.E.2d at 448. "With adequate cautionary instructions from the trial judge, vigorous cross-examination of the government's experts, and challenging testimony from defense experts, the jury should be allowed to make its own factual determination as to whether the evidence is reliable." *United States v. Jakobetz*, 955 F.2d at 800. See, also, *Hopkins v. State* (Ind.1991), 579 N.E.2d 1297, 1303-1304. Sufficient evidence and testimony were presented at trial in this case to support the reliability of the DNA evidence.

In summary, we find no merit to Pierce's argument that the trial court erred in admitting the DNA evidence or that the DNA analysis was unreliable and should have been excluded.

IV

Other Errors

Pierce also raises two additional errors: (1) the trial court erred in giving an instruction that the jury is required to determine unanimously that the defendant is not guilty of the crime charged before it may consider a lesser included offense; and (2) appellate counsel was ineffective because he failed to cause a transcript of the trial court's jury instructions, which contained reversible error, to be included in the record on appeal.

The erroneous jury instruction was not raised as error below. Issues not raised at the trial or appellate level need not be reviewed by this court. *Baker v. West Carrollton* (1992), 64 Ohio St.3d , N.E.2d ; *Cascioli v. Central Mut. Ins. Co.* (1983), 4 Ohio St.3d 179, 180, 4 OBR 457, 458, 448 N.E.2d 126, 127, fn. 2; *State v. Wallen* (1971), 25 Ohio St.2d 45, 54 O.O.2d 172, 266 N.E.2d 561; *State v. Carter* (1970), 21 Ohio St.2d 212, 50 O.O.2d 446, 256 N.E.2d 714, vacated in part on other grounds (1972), 408 U.S. 936, 92 S.Ct. 2859, 33 L.Ed.2d 752; *Toledo v. Reasonover* (1965), 5 Ohio St.2d 22, 34 O.O.2d 13, 213 N.E.2d 179; *State ex rel. Babcock v. Perkins* (1956), 165 Ohio St. 185, 59 O.O. 258, 134 N.E.2d 839. In any event, the instruction given in this case is substantially similar to the instruction in *State v. Thomas* (1988), 40 Ohio St.3d 213, 220, 533 N.E.2d 286, 293, certiorari denied (1989), 493 U.S. 826, 110 S.Ct. 89, 107 L.Ed.2d 54, and, as in *Thomas*, the prejudicial effect of such an instruction, if any, on Pierce is negligible.

It follows that Pierce's ineffective assistance of counsel argument, based upon the allegedly erroneous jury instruction, must also be rejected.

For the foregoing reasons, the judgment of the court of appeals is affirmed.

Judgment affirmed.

Sweeney, Holmes, Douglas, Wright, H. Brown and Resnick, JJ., concur.

FOOTNOTES:

1 DNA typing is known by several other names, such as DNA profiling, DNA fingerprinting, DNA identification tests, and DNA tests. DNA Fingerprinting: The Castro Case (1990), 3 Harv.J.L. & Tech. 223, 225, fn. 9.

2 At least five states (Louisiana, Maryland, Minnesota, Virginia, and Washington) have enacted legislation which recognizes the admissibility of DNA evidence in criminal cases. Louisiana Rev.Stat. 15:441.1 (1992); Maryland Ann.Code Courts and Judicial Proceedings 10-915 (1991 Cum.Supp.); Minnesota Stat.Anno. 634.25 and 634.26 (1992 Cum.Supp.); Virginia Code 19.2-270.5 (1990); Washington Rev.Code Anno. 43.43.752 through 43.43.758 (1992 Cum.Supp.). See National Research Council, DNA Technology in Forensic Science, 6-12, fn. 36 at 6-23.

"Maryland requires that the DNA report be delivered to the defendant 2 weeks before the criminal proceeding and specifies that the defendant may require a witness who analyzed the sample to testify as to the chain of custody. The Minnesota statute states that in any civil or criminal trial or hearing DNA evidence is admissible without 'antecedent expert testimony that DNA evidence provides a trustworthy and reliable method of identifying characteristics in an individual's genetic material upon a showing that the offered testimony meets the standards for admissibility set forth in the Rules of Evidence'; a companion provision specifically permits the admission of 'statistical population frequency evidence * * * to demonstrate the fraction of the population that would have the same combination of genetic markers as was found in a specific human biological specimen.' Louisiana provides that the 'evidence of deoxyribonucleic acid profiles, genetic markers of the blood, and secretor status of the saliva offered to establish the identity of the offender of any crime is relevant as proof in conformity with the Louisiana Code of Evidence.'" Id. at 6-12.

3 For a discussion of proficiency tests conducted by the California Association of Crime Lab Directors on the accuracy of three commercial laboratories conducting DNA testing, including Cellmark, see Ford & Thompson, A Question of Identity, Some Reasonable Doubts About DNA "Fingerprints," The Sciences (Jan./Feb. 1990) 37, 42; Giannelli & Imwinkelreid, Scientific Evidence (Cum.Supp.1991) 116, 122.

4 The court in Pennell struck evidence of the statistical probabilities or frequencies of DNA blurted out by a witness for the prosecution, finding that the state had failed to demonstrate the degree of reliability necessary to admit such evidence. Significantly, Delaware basically subscribes to the Frye test for the admissibility of scientific evidence.