Use of Human Leukocyte Antigen Test Results to Establish Paternity

I. INTRODUCTION

The need for establishing paternity may be greater today than at any previous time. Numerous legal consequences in our society are dependant upon establishing a paternity relationship, and with the expansion of the welfare system and rapid growth of child support legislation on both state and federal levels,[1] paternity proceedings have become a substantial state concern. For example, paternity must be established in order for the illegitimate child to exercise his legal rights, duties, privileges, and obligations in relation to his putative father.[2] Proof of paternity is a crucial factor in determining whether the child can inherit by intestate succession from his natural father[3] or whether he can receive father-related welfare benefits.[4] Additionally, state initiated paternity suits charge

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[1]*See* Federal Social Security Act, Title IV-D, 42 U.S.C. §§ 651-60 (1976). Part D of Title IV of the Act requires states to establish or designate an agency to obtain and enforce orders for support of children for whom application to Aid to Families with Dependent Children has been made and, where necessary, to establish paternity in order to reduce the number of welfare recipients. *Id.*

[2]The illegitimate is entitled to fourteenth amendment equal protection in many substantive areas without first establishing paternity. Unacknowledged illegitmate children were accorded the right to recover for the wrongful death of their mother in Levy v. Louisiana, 391 U.S. 68 (1968), and they can inherit by intestate succession through their mother. *See* A—.B—. v. C—.D—., 150 Ind. App. 535, 277 N.E.2d 599 (1971); IND. CODE § 29-1-2-7 (1976). Illegitimates are also entitled to receive support through various federal, state, and local welfare programs. *See* Federal Social Security Act, Title IV-D, 42 U.S.C. §§ 651-660 (1976).

[3]Lalli v. Lalli, 439 U.S. 259 (1978) (the Court upheld the constitutionality of a statute which required an order of filiation within a specified period of time (in this case, two years after the child's birth) before the illegitimate was entitled to inherit by intestate succession from his natural father); Trimble v. Gordon, 430 U.S. 762 (1977) (the Court held that a statute which automatically disallows an illegitimate child's inheritance by intestate succession from his father violates the Equal Protection Clause of the fourteenth amendment). For Indiana case law applying *Lalli*, see Marsch v. Lill, 396 N.E.2d 695 (Ind. Ct. App. 1979) and Tekulve v. Turner, 391 N.E.2d 673 (Ind. Ct. App. 1979) (holding that IND. CODE § 29-1-2-7 (1976) which allows an illegitimate child to inherit from its natural father where paternity of the child has been established in a court of law during the father's lifetime, or where the putative father marries the mother *and* acknowledges the child to be his own, does not violate the Equal Protection Clause of the fourteenth amendment).

[4]Mathews v. Lucas, 427 U.S. 495 (1976) (the Court upheld the constitutionality of certain provisions of the Social Security Act which condition the eligibility of illegitimate children for a surviving child's insurance benefits upon a showing that the deceased wage earner was the child's parent and that the child was dependent on the

a father with the duty to financially support his child, thereby reducing the state's welfare obligation[5] and alleviating the burden on taxpayers.

The public interest in shifting the support obligation of an illegitimate from the state welfare department to the responsible father and the increasing number of substantive legal rights conferred on illegitimates are modern developments which mandate fundamental reform of the paternity action. In response to this need for reform, Indiana has taken affirmative steps toward the accurate and impartial identification of the father of an illegitimate child. The Indiana legislature recently amended its paternity statute[6] to facilitate compliance with the federal law which makes federal funds available to states that develop appropriate plans for establishing paternity and enforcing child support.[7] The statute now authorizes the state or county welfare departments to initiate paternity actions in cases where public assistance has been furnished for the benefit of the child.[8] In addition, Indiana is in the vanguard in liberalizing and revising its antiquated rules of evidence in paternity actions to reflect recent scientific advancements in the areas of blood grouping and tissue typing. Indiana Code section 31-6-6.1-8[9] was amended on

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parent for support); Jimenez v. Weinberger, 417 U.S. 628 (1974) (the Court held that Social Security Act § 416(h)(2)-(3), which entitles children of wage earner to his disability benefits, is unconstitutional because it arbitrarily discriminates between classes of illegitimates); Weber v. Aetna Cas. & Sur. Co., 406 U.S. 164 (1972) (dependent unacknowledged illegitimate children are on an equal footing with dependent legitimate children and are therefore entitled to recover benefits under Louisiana workmen's compensation laws for the death of their natural father). Although under *Jimenez* and *Weber* an illegitimate can recover despite the fact that paternity has not been legally established, nevertheless there must be a showing that the child is in a "direct blood and dependency relationship with the deceased" in order to avoid spurious claims. 406 U.S. at 175. The illegitimate still has to prove that the wage earner is his natural father in order to receive death or disability benefits through him. In both *Jimenez* and *Weber*, the children were at least informally acknowledged by the father and were totally dependent on the father for support.

[5]*See* Shaw & Kass, *Illegitimacy, Child Support, and Paternity Testing*, 13 HOUS. L. REV. 41 (1975); Krause, *Scientific Evidence and the Ascertainment of Paternity*, 5 FAM. L.Q. 252, 252-53 (1971).

[6]IND. CODE §§ 31-6-6.1-1 to -16 (Supp. 1980) (amended by Act of Feb. 27, 1980, Pub. L. No. 183, §§ 1-9, 1980 Ind. Acts 1595).

[7]Social Security Act, Title IV-D, 42 U.S.C. §§ 651-660 (1976 & Supp. III 1979).

[8]IND. CODE § 31-6-6.1-2 (b) (Supp. 1980).

[9]*Id.* § 31-6-6.1-8 (Supp. 1980), provides the following:

> Upon the motion of any party, the court shall order all of the parties to the action to undergo either a blood grouping test or a Human Leukocyte Antigen (HLA) tissue test. The tests shall be performed by a qualified expert approved by the court, *and the results of the tests may be received in evidence.*

Id. (emphasis added).

February 27, 1980,[10] to allow the results of a human leukocyte antigen (HLA) tissue typing test to be received into evidence.[11] This test is more sophisticated than its predecessors and permits a more

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[10]Act of Feb. 27, 1980, Pub. L. No. 183, § 1-9, 1980 Ind. Acts 1595.

[11]The principles of genetics and blood chemistry which form the basis for the paternity tests are beyond the scope of this Note. For a detailed scientific analysis of these tests, see Abbott, Sell & Krause, *Joint AMA-ABA Guidelines: Present Status of Serologic Testing in Problems of Disputed Parentage*, 10 FAM. L.Q. 247 (1976) [hereinafter cited as the *AMA-ABA Guidelines*]; Lee, *Current Status of Paternity Testing*, 9 FAM. L.Q. 615 (1975); Terasaki, *Resolution by HLA Testing of 1000 Paternity Cases Not Excluded by ABO Testing*, 16 J. FAM. L. 543 (1978).

A short description of the HLA Antigen Blood Grouping Test is, however, necessary so that the reader may more fully understand its far-reaching implications on the ascertainment of paternity. The HLA test is a new method which is based on the identification and typing of antigen markers found in white blood cells and other tissues of the body. Carlyon v. Weeks, 387 So. 2d 465, 466 (Fla. Dist. Ct. App. 1980).

> It is essentially a tissue-typing test which can be performed on, for example, lymph or spleen tissues as well as white blood cells. The HLA test was developed and used primarily in organ transplantat[ion] for purposes of determining if organs from a donor would be accepted or rejected by the possible recipient.

Id. See also S. SCHATKIN, DISPUTED PATERNITY PROCEEDINGS, § 8.08 (4th rev. ed. 1980).

The HLA testing procedure is similar to the red blood cell typing procedure used for the ABO blood group system. Carlyon v. Weeks, 387 So. 2d at 466. However, the results of the ABO system render only a 50% to 60% chance that a particular man is the father. Cramer v. Morrison, 88 Cal. App. 3d 873, 878, 153 Cal. Rptr. 865, 867 (1979). The HLA system is a more sophisticated procedure which involves a larger number of antigen markers in the white blood cells. *Id.* The basic theory is that by identifying the antigen markers of a child and of the mother, the child's antigen genetic markers which could only be inherited from the father can be determined. Terasaki, *supra*, at 548-49. The advantage of the HLA test is that, due to the large number of antigen markers (as many as sixty-two) which have been identified, it may disclose rare antigens on the cells of two people which they probably have in common because of genetic inheritance rather than through mere chance. The HLA test thus permits identification of the father with a higher degree of certainty than was possible by the ABO red blood grouping. *Id.* at 543-44, 548-49, 554-55. Most people are "rare" types in the sense that only about one out of a thousand people have a similar HLA type. *Id.* at 544. Therefore, a "rare" type that occurs in a putative father and that also occurs in a child produces a high degree of probability (between 95% and 99%) that the putative father is, in fact, the father. *Id.* "On the other hand, if the putative father is wrongly accused, he can usually be excluded because the child would have inherited a different rare type from the actual father." *Id.*

Because of this remarkable advance in the number and accuracy of paternity tests, the probability of determining whether the accused man is actually the father is greatly increased. Probability estimates are based on the frequencies of genetic markers in the general population; the investigator compares the "frequency of a given father-mother-child constellation in a sample of the alleged actual father's blood with the constellation in a sample of blood from a random man." Krause, *The Uniform Parentage Act*, 8 FAM. L.Q. 1, 11 (1974). However, although these paternity tests can conclusively establish exclusion, they can never establish the likelihood of paternity with absolute certainty. Krause, *supra* note 5, at 261.

precise typing of a father and child's blood.[12] As the requisite blood type becomes more defined, a higher percentage of men are excluded from being the father of the child in question, thereby narrowing the group of potential fathers.[13] Consequently, proof of parentage is more conclusive.[14] The 1980 amendment is all the more important because it does not specify whether these new tests are admissible to establish paternity rather than merely to exclude the probability of paternity.[15] Thus, the way is open for the introduction into evidence of the results of these tests to show the likelihood that the named man is the actual father.

Despite the obvious probative and evidentiary value of these medical techniques on the issue of paternity, there are several drawbacks in introducing such highly complex scientific evidence into the trial process. This Note will concentrate on balancing the probative value of these advancements against the prejudicial effect they may have on the accuracy and fairness of the fact-finding process. First, however, a review of Indiana and national legislation concerning the use of blood group evidence in paternity trials will be presented.

II. HISTORICAL BACKGROUND

A. Comparison of Indiana Code Section 31-6-6.1-8 to its Predecessor Statutes

1. The 1953 Statute.—Historically, Indiana paternity statutes have reflected scientific trends in blood grouping and tissue testing. In 1953, the Indiana Legislature enacted a statute which allowed blood tests to be received into evidence only to show that the accused man could not be the father.[16] The three standard blood tests used at this time were based on red blood cell groupings,[17] and when used together, they enabled a falsely accused man to exclude himself from

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[12]Krause, *supra* note 5, at 261.

[13]*Id.*

[14]*Id.*

[15]*See* IND. CODE § 31-6-6.1-8 (Supp. 1980).

[16]Act of Mar. 13, 1953, Ch. 161, 1953 Ind. Acts 575 (codified at IND. CODE § 34-3-3-1 (1976) (repealed by Act of March 10, 1978, Pub. L. No. 136, § 57, 1980 Ind. Acts 1196)). The tests were used only "to determine whether or not the defendant [could] be excluded as being the father of the child, and the results of such tests [might] be received in evidence, but only in cases where definite exclusion [was] established." IND. CODE § 34-3-3-3 (1976) (repealed by Act of March 10, 1978, Pub. L. No. 136, § 57, 1980 Ind. Acts 1196).

[17]C. MCCORMICK, THE LAW OF EVIDENCE, § 211 at 517-23 (2d ed. 1972). The red blood cell groupings were the ABO, MN, and Rh-Hr. *Id.*

fatherhood about fifty-one percent of the time.[18] The courts successfully merged this medical knowledge into the legal sphere; blood tests were admissible into evidence to establish conclusive proof of nonpaternity.[19] In *Beck v. Beck*,[20] the Indiana Court of Appeals said:

> "If the negative fact [of paternity] is established [scientifically] it is evident that there is a great miscarriage of justice to permit juries to hold on the basis of oral testimony, passion or sympathy, that the person charged is the father and is responsible for the support of the child and other incidents of paternity."
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> When medical science has perfected certain tests to the point where it can be said with almost medical certainty that something is a fact, the court should not hide in the dark ages and be bound by archaic rules which subvert the truth and impede the sound administration of justice.[21]

The *Beck* court clearly accepted the validity and accuracy of the blood tests. However, although the test results were conclusive in excluding a falsely accused man as the father, they were inconclusive in establishing that a particular male was actually the father.[22]

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[18] *Id.* at 519.

[19] *See, e.g.*, Beck v. Beck, 159 Ind. App. 20, 304 N.E.2d 541 (1973). The court in *Beck* held that admissibility of blood group test results to establish nonpaternity is conditioned upon a showing that the results of the test exclude paternity. *See also* L.F.R. v. R.A.R., 370 N.E.2d 936 (Ind. Ct. App. 1977), *vacated*, 378 N.E.2d 855 (Ind. 1978); A—.B—. v. C—.D—., 150 Ind. App. 535, 277 N.E.2d 599 (1971) (the court held that medical evidence showing nonpaternity could not rebut the persumption of legitimacy absent a showing that the tests involved were accurate. *Id.* at 564, 277 N.E.2d at 619).

[20] 159 Ind. App. 20, 304 N.E.2d 541 (1973).

[21] *Id.* at 26, 304 N.E.2d at 545 (quoting the prefatory note to the UNIFORM ACT ON BLOOD TESTS TO DETERMINE PATERNITY, 9 U.L.A. 102 (1957)). The *Beck* court, in holding that the blood tests should conclusively establish nonpaternity, remedied the unjustness inherent in allowing the trier of fact to rule for the plaintiff in a paternity action where the blood tests showed the impossibility of the defendant being the father of the child. *See* Arais v. Kalensnikoff, 10 Cal. 2d 428, 74 P.2d 1043 (1937) & Berry v. Chaplin, 74 Cal. App. 2d 652, 169 P.2d 442 (1946) (juries were permitted to find men to be the fathers despite medical evidence to the contrary).

[22] 159 Ind. App. at 24-25, 304 N.E.2d at 544. Probable reasons for this result are the inconclusiveness of only 50% to 60% probability of paternity establishable under the existing blood tests, *see* Cramer v. Morrison, 88 Cal. App. 3d 873, 878, 153 Cal. Rptr. 865, 867 (1979), and the possibility that the jury might misinterpret and give undue weight to these statistics. *See* C. MCCORMICK, *supra* note 17, § 211 at 522. For these reasons courts determine that the prejudice would greatly outweigh the probative value of such evidence. *See id.*

2. The 1979 Revision.—After Indiana Code section 34-3-3-1 was repealed in 1978,[23] the Indiana Legislature in 1979 enacted Public Law Number 277 which states: "Upon the motion of any party, the court shall order all of the parties to the action to undergo either a blood grouping test or a Human Leukocyte Antigen (HLA) tissue test. The tests shall be performed by a qualified expert approved by the court."[24] The legislature, while apparently recognizing the value and reliability of HLA tests in establishing paternity, failed to mention the evidentiary value of such tests. Therefore, it was unclear whether the tests were to be used to establish paternity as well as nonpaternity. Moreover, the legislature was silent with respect to integration of these scientific breakthroughs into the fact-finding process, especially in view of the usual time lag between scientific discovery and legal recognition.[25]

3. The 1980 Amendment.—The legislature in 1980 amended Indiana Code section 31-6-6.1-8 to liberalize the admissibility of HLA test results.[26] The statute now reads in pertinent part: "[T]he results of the tests *may* be received in evidence."[27] The amendment is again, however, highly ambiguous. It neither specifies whether the tests are to be used to demonstrate paternity in addition to nonpaternity, nor does it specify the weight to be accorded such evidence. Although progressive in adapting medical advancements in the area of paternity testing to rules of evidence, the Indiana legislature left the judiciary the task of insuring that this scientific evidence is fairly and efficiently applied in the paternity proceeding. It left significant discretion to the courts in various matters, such as (1) demonstration that these new tests are reliable and have received general acceptance in the scientific community;[28] (2) evaluation of whether the evidence is of sufficient probative value on the issue of paternity to outweigh the possible danger of its misuse; (3) determination of the proper function of scientific evidence at trial;[29] and (4) ad-

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[23]IND. CODE § 34-3-3-1 (1976) (repealed by Act of Mar. 10, 1978, Pub. L. No. 136, § 57, 1978 Ind. Acts 1196).

[24]Act of Apr. 10, 1979, Pub. L. No. 277, § 1, 1979 Ind. Acts 1446 (currently codified at IND. CODE § 31-6-6.1-8 (Supp. 1980)).

[25]*See* Shaw & Kass, *supra* note 5, at 51.

[26]Act of Feb. 27, 1980, Pub. L. No. 183, § 5, 1980 Ind. Acts 1595 (amending IND. CODE § 31-6-6.1-8 (1979)).

[27]IND. CODE § 31-6-6.1-8 (1980) (emphasis added).

[28]*See, e.g.*, A—.B—. v. C—.D—., 150 Ind. App. 535, 564-65, 277 N.E.2d 599, 619 (1971). The court in this case held that, before blood tests can conclusively establish nonpaternity, the accuracy of the particular test method must first be demonstrated. This principle will be more fully developed in the subsequent discussion.

[29]Professor Jaffee, for example, advocates that scientific proof should be severely limited at trial. Jaffee, *Comment on the Judicial Use of HLA Paternity Test Results*

ministration of proper jury instructions in order to assure the correct interpretation and application of the blood and tissue test results in conjunction with other circumstantial evidence conventionally used in paternity trials.[30]

B. Section 31-6-6.1-8 Compared with the Uniform Acts on Paternity

Compared with other jurisdictions, Indiana is remarkably progressive in revising its rules of evidence in paternity proceedings to conform with modern medical advancements in the area of paternity testing. Arguably, the ambiguity of the 1980 amendment to section 31-6-6.1-8 allows for utilization of blood and tissue test results as evidence to indicate paternity probability; if so, this would be a significant departure from prior Indiana practice.

Various Uniform Acts provide for the admission of blood test results as relevant evidence in the determination of paternity.[31] Occassionally, these Acts give greater weight to the results of blood tests than have the courts.[32] Section four of the Uniform Act on Blood Tests to Determine Paternity[33] makes test results conclusive

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and Other Statistical Evidence: A Response to Terasaki, 17 J. FAM. L. 457 (1979). Jaffee feels that HLA test results estimating probability of paternity are legally inappropriate as "independent, main-case, direct examination evidence on an ultimate issue of paternity." *Id.* at 484. They would be performing a legitimate function at trial, however, "where they appear merely as part of the basis of an otherwise admissible expert opinion, where they are directed merely at issues of secondary, basic fact, or, in any event, where they function merely as impeachment, contradiction, or rehabilitation or secondary corroboration." *Id.* at 476.

[30]Examples of other such evidence include: (1) evidence of sexual intercourse between the mother and alleged father during the possible conception period; (2) an expert's opinion concerning the probability of the alleged father's paternity based upon the duration of the mother's pregnancy; and (3) the practice of comparing the child's resemblance to that of the putative father. *See* UNIFORM PARENTAGE ACT § 12; Krause, *supra* note 2, at 272.

[31]*E.g.*, UNIFORM ACT ON BLOOD TESTS TO DETERMINE PATERNITY §§ 1-2,4; UNIFORM ACT ON PATERNITY §§ 7-8,10; UNIFORM PARENTAGE ACT § 12.

[32]*See* UNIFORM ACT ON BLOOD TESTS TO DETERMINE PARTERNITY §§ 7-8,10; UNIFORM PARENTAGE ACT § 12. Test results for the purpose of showing nonpaternity are now widely received in evidence. *See, e.g.*, Beach v. Beach, 114 F.2d 479 (D.C. Cir. 1940); Beck v. Beck, 159 Ind. App. 20, 304 N.E.2d 514 (1973); Cortese v. Cortese, 10 N.J. Super. 152, 76 A.2d 717 (1950); C. v. C., 200 Misc. 631, 109 N.Y.S.2d 276 (Sup. Ct. 1951); State v. Camp, 286 N.C. 148, 209 S.E.2d 754 (1974); Commonwealth v. Zammarelli, 17 Pa. D. & C. 229 (Fayette County Ct. Quarter Sess., 1931). Few jurisdictions have, however, allowed test results in for the purpose of showing the likelihood of paternity. *See, e.g.*, Cramer v. Morrison, 88 Cal. App. 3d 873, 153 Cal. Rptr. 865 (1979); Carlyon v. Weeks, 387 So. 2d 465 (Fla. Dist. Ct. App. 1980); Malvasi v. Malvasi, 167 N.J. Super. 513, 401 A.2d 279 (1979).

[33]UNIFORM ACT ON BLOOD TESTS TO DETERMINE PATERNITY § 4. This legislation, drafted in response to the unscientific decisions in Arais v. Kalensnikoff, 10 Cal. 2d 428, 74 P.2d 1043 (1937) and Barry v. Chaplain, 74 Cal. App. 2d 652, 769 P.2d 442 (1946),

on nonpaternity and opens the door for the affirmative use of blood test evidence to estimate parentage. The Commissioners' Prefatory Note[34] explains that the Act was drawn not only to insure that accurate test results establishing exclusion be entitled to conclusive weight but also to permit admissibility in the court's discretion of evidence tending to prove paternity. Section four concludes, "If the experts conclude that the blood tests show the possibility of the alleged father's paternity, admission of this evidence is within the discretion of the court, depending upon the infrequency of the blood type."[35] By conditioning the admissibility of probability statements "on the infrequency of the blood type,"[36] the Act integrates advancements of science into the legal process.[37]

A minority of states have adopted either the Uniform Act on Blood Tests to Determine Paternity[38] or the Uniform Act on Paternity.[39] A third act, the Uniform Parentage Act, has also been adopted in a minority of jurisdictions.[40] This Act provides for more liberal admissibility of medical evidence:

> Evidence relating to paternity may include:
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> (3) blood test results, weighted in accordance with evidence,

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sets out procedures for ordering the tests, selecting experts, and giving effect to the test results.

[34]9 U.L.A. 102, 103-04 (1957).

[35]UNIFORM ACT ON BLOOD TESTS TO DETERMINE PATERNITY § 4.

[36]*Id.*

[37]As discussed in note 11 *supra*, new blood typing systems and identification of increasing numbers of antigen markers increase the rarity of a particular blood group combination.

[38]*See* 9A U.L.A. 102, 102 (1957) (prefatory note). The following are among the enacted versions of the UNIFORM ACT ON BLOOD TESTS TO DETERMINE PATERNITY: CAL. EVID. CODE §§ 890-897 (West 1966) (omitting last sentence of Section 4); N.H. REV. STAT. ANN. §§ 522:1-10 (1955); OKLA. STAT. ANN. tit. 10, §§ 501-508 (West Supp. 1980); UTAH CODE ANN. §§ 78-45a-7 to -17 (1977).

[39]*See* 9A U.L.A. 623, 623 (1979) (prefatory note). The following are enacted versions of the UNIFORM ACT ON PATERNITY: KY. REV. STAT. §§ 406.011-.180 (1972 & Supp. 1980); ME. REV. STAT. ANN. tit. 19, §§ 271-287 (1981); MISS. CODE ANN. §§ 93-9-1 to -75 (1972); N.H. REV.STAT. ANN. §§ 168-A:1 to A:12 (1955) (omitting section 10); UTAH CODE ANN. §§ 78-45a-1 to -17 (1977). Sections 7-10 of the UNIFORM ACT ON PATERNITY were taken, with minimal adjustments, from the UNIFORM ACT ON BLOOD TESTS TO DETERMINE PATERNITY §§ 1-4. 9A U.L.A. 623, 634 (1979).

[40]*See* 9A U.L.A. 579, 579 (1979) (prefatory note). The following are enacted versions of the UNIFORM PARENTAGE ACT: CAL. CIVIL CODE §§ 7000-7021 (West Supp. 1981); COLO. REV. STAT. §§ 19-6-101 to -129 (1973); HAW. REV. STAT. §§ 584-1 to -26 (1976); MONT. REV. CODES ANN. §§ 61-301 to -334 (Supp. 1977); N.D. CENT. CODE §§ 14-17-01 to -26 (Supp. 1977); WASH. REV. CODE §§ 26.26.010 to .905 (Supp. 1980); WYO. STAT. §§ 14-2-101 to -120 (1978).

> if available, of the statistical probability of the alleged father's paternity;
> (4) medical or anthropological evidence relating to the alleged father's paternity of the child based on tests performed by experts. . . . ; and
> (5) all other evidence relevant to the issue of paternity of the child.[41]

Although the use of statistics bearing on the probability of paternity is allowed in the Uniform Act on Parentage and arguably is allowed in the court's discretion under the Uniform Act on Paternity and the Uniform Act on Blood Tests to Determine Paternity, the Joint AMA-ABA Guidelines[42] recommend that these statistics be even more readily admitted. The Guidelines recommend:

> that the National Conference of Commissioners on Uniform State Laws develop new uniform legislation or amend the "Uniform Parentage Act" and the "Uniform Blood Test Act" to . . . simplify the admissibility in evidence of test results and the probative effect thereof, including the evidentiary value of estimations of "likelihood of paternity."[43]

By failing to specify the probative value to be given to these blood test results, the Indiana and Uniform Acts are equally hesitant in utilizing statistics to estimate the likelihood of paternity, as opposed to nonpaternity. As a result, courts must fashion standards for admission of blood test results into evidence for this purpose.

III. General Requirements for Admission of Evidence

A. Logical and Legal Relevancy

Admission of evidence necessarily requires a balancing of the conflicting requirements of logical and legal relevancy,[44] or in other words, the weighing of the probative value of such evidence and the dangers inherent in its application.

1. Logical Relevancy.—All evidence must meet a minimum standard of relevancy of probative quality in order to be admitted.[45] Evidence is "relevant" if, in the light of general experience, it logically tends to prove or disprove some issue or fact material to

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[41]Uniform Parentage Act § 12.

[42]*AMA-ABA Guidelines, supra* note 11.

[43]*Id.* at 283.

[44]For a thorough discussion of logical and legal relevancy, see C. McCormick, *supra* note 17, §§ 184-185.

[45]*Id.* § 184.

the controversy.[46] The general standard for the admissibility of evidence as relevant is that "it makes the sought-for inference more probable than it would be without the evidence. Accordingly, evidence may be found relevant although its ability to persuade is extremely light."[47]

Those advocating the use of HLA test results to prove probability of paternity draw their arguments from the premise of "logical relevancy."[48] The test results are used as circumstantial evidence to prove the fact of paternity, and because HLA tests are highly accurate in establishing paternity, the results of the test are clearly probative and therefore logically relevant in an action to establish paternity. Proponents argue that admissibility of scientific evidence advances the accuracy and fairness of the fact-finding process because the evidence assists the trier of fact in resolving the issue of paternity with more precision than would some of the more conventional evidence,[49] such as whether the putative father had access to the mother during the period of conception.[50]

2. Legal Relevancy.—Although HLA tissue typing results are highly probative relevant evidence and therefore prima facie admissible, a trial judge may use his discretion to reject this evidence if there are counterbalancing factors outweighing its probative value.[51] The process of excluding probative evidence because of certain risks inherent in its application is known as "legal relevancy."[52] Counterbalancing factors which may outweigh the probative value of the evidence include:

> First, the danger that the facts offered may unduly arouse the jury's emotions of prejudice, hostility or sympathy. Second, the probability that the proof and the answering

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[46]*Id.* § 185. Several recent Indiana courts have defined relevancy as the "logical tendency of evidence to prove a material fact." Lake County Council v. Arrendondo, 266 Ind. 318, 321, 363 N.E.2d 218, 220 (1977); Indiana Nat'l Corp. v. FACO, Inc., 400 N.E.2d 202, 206 (Ind. Ct. App. 1980); Hedges v. Public Serv. Co., 396 N.E.2d 933, 937 (Ind. Ct. App. 1979).

[47]Smith v. Crouse-Hinds Co., 373 N.E.2d 923, 926 (Ind. Ct. App. 1978), *transfer denied*, 392 N.E.2d 1168 (Ind. 1979).

[48]*See, e.g.*, S. SCHATKIN, *supra* note 11, at §§ 8.06-.14; *AMA-ABA Guidelines*, *supra* note 11; Chakrabortz, Shaw & Schull, *Exclusion of Paternity: The Current State of the Art*, 26 AM. J. OF HUMAN GENETICS 477 (1974); Krause, *supra* note 5; Lee, *supra* note 11; Salisbury, *The Use of Blood Test Evidence in Paternity Suits: A Scientific and Legal Analysis*, 30 FACULTY L. REV. 47 (1972); Shaw & Kass, *supra* note 5.

[49]*See* authorities cited in note 48 *supra*.

[50]*See, e.g.*, Collins v. Wise, 156 Ind. App. 424, 296 N.E.2d 887 (1973); Kintz v. State, 71 Ind. App. 225, 124 N.E. 739 (1919); Gemmill v. State, 16 Ind. App. 154, 43 N.E. 909 (1896).

[51]Smith v. Crouse-Hinds Co., 373 N.E.2d 923, 926 (Ind. Ct. App. 1978).

[52]*See* C. MCCORMICK, *supra* note 17, § 185 at 440-41.

> evidence that it provokes may create a side issue that will unduly distract the jury from the main issues. Third, the likelihood that the evidence offered and the counter proof will consume an undue amount of time. Fourth, the danger of unfair surprise to the opponent when, having no reasonable ground to anticipate this development of the proof, he would be unprepared to meet it.[53]

A fifth counterbalancing factor which opponents of nonexclusionary HLA results propose is the danger that the evidence will confuse or mislead the jury.[54] These objections are inherent in the use of scientific evidence at trial.[55] Because of the technical nature of the evidence and the degree of certainty and infallibility suggested by scientific data in general, there is a danger that the jury may attach exaggerated significance to the test results.[56] Instead of using the data to corroborate the nonscientific proof of paternity, the jury could be so influenced by the scientific data that it would ignore more conventional evidence. With HLA test results, statistics would no doubt show a very high degree of probability, and the jury might consider that they alone would suffice to meet the "preponderance of the evidence" standard which is required in paternity actions.[57]

B. General Admissibility of New Scientific Evidence

Evaluation of the propriety of admitting nonexclusionary test results is closely linked to factors involved in accepting any new scientific technique or discovery as evidence. Because of the "misleading aura of certainty which often envelops a new scientific process, obscuring its currently experimental nature,"[58] courts have

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[53]*Id.* at 439-40. *Accord*, Smith v. Crouse-Hinds Co., 373 N.E.2d at 926 (listing the identical factors).

[54]Smith v. Crouse-Hinds Co., 373 N.E.2d at 926. *See also* State v. Ingram, 399 N.E.2d 808 (Ind. Ct. App. 1980); Walters v. Kellam & Foley, 172 Ind. App. 207, 360 N.E.2d 199 (1977).

[55]*See* C. McCORMICK, *supra* note 17, § 202.

[56]*See* United States v. Baller, 519 F.2d 463, 465 (4th Cir. 1975); United States v. Addison, 498 F.2d 741, 744 (D.C. Cir. 1974); People v. Kelly, 17 Cal. 3d 24, 31-32, 549 P.2d 1240, 1245, 130 Cal. Rptr. 144, 149 (1976); Huntingdon v. Crowley, 64 Cal. 2d 647, 656, 414 P.2d 382, 390, 51 Cal. Rptr. 254, 262 (1966).

[57]Collins v. Wise, 156 Ind. App. at 426, 296 N.E.2d at 889; Cohen v. Burns, 149 Ind. App. 604, 606, 274 N.E.2d 283, 284 (1971). *See* Ellman & Kaye, *Probabilities and Proof: Can HLA and Blood Group Testing Prove Paternity?*, 54 N.Y.U.L. REV. 1131, 1159 (1979).

[58]Huntingdon v. Crowley, 64 Cal. 2d at 656, 414 P.2d at 390, 51 Cal. Rptr. at 262 (1966). *See also* People v. Kelly, 17 Cal. 3d at 31, 549 P.2d at 1245, 130 Cal. Rptr. at 149, in which the court warned that admission of evidence based on new scientific principles warrants thorough judicial consideration: "Several reasons founded in logic and common sense support a posture of judicial caution in this area. Lay jurors tend to

deliberately and cautiously retarded the admission of evidence born of new techniques until the "scientific community has had ample opportunity to study, evaluate and accept its reliability."[59] Hence, there is generally a considerable lag between scientific advances and their acceptance as evidence in a legal proceeding.[60]

1. Acceptance by the Relevant Scientific Community.—The most crucial factor in the decision to admit new scientific evidence is whether it has been "sufficiently established to have gained general acceptance in the particular field in which it belongs" as required by the landmark case of *Frye v. United States*.[61] Several other courts have accepted the *Frye* test in determining the underlying reliability of a new scientific technique.[62] The *Frye* test requires that when faced with a novel method of proof, expert testimony is usually required to establish the validity of the technique and its general acceptance in the relevant scientific community.[63] Not only must the

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give considerable weight to 'scientific' evidence when presented by 'experts' with impressive credentials."

[59]People v. Kelly, 17 Cal. 3d at 41, 549 P.2d at 1251, 130 Cal. Rptr. at 155 (citation omitted). The *Kelly* court explained this proposition further:

> Ideally, resolution of the general acceptance issue would require consideration of the views of a typical cross-section of the scientific community, including representatives, if there are such, of those who oppose or question the new technique.
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> . . . .
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> . . . [T]rial courts should take affirmative steps to assure that an accurate description of the [relevant] scientific community is present before the court. . . . "The court should then make an effort to ascertain the extent of any opposition so identified . . . ."

Id. at 37, 549 P.2d at 1248-49, 130 Cal. Rptr. at 152-53 (quoting Comment, *The Voiceprint Dilemma: Should Voices be Seen and not Heard?*, 35 MD. L. REV. 267, 293 (1975)). *See also* Strong, *Questions Affecting the Admissibility of Scientific Evidence*, 1970 U. ILL. L.F. 1, 16-17.

[60]People v. Kelly, 17 Cal. 3d at 31-32, 549 P.2d at 1245, 130 Cal. Rptr. at 149; People v. Spigno, 156 Cal. App. 2d 279, 289, 319 P.2d 458, 464 (1957).

[61]293 F. 1013, 1014 (D.C. Cir. 1923) (dealing with acceptance of lie-detector tests as scientific evidence). *See* Phillips v. Jackson, 615 P.2d 1228, 1233 (Utah 1980) (characterising the *Frye* test as the "most widely used standard").

[62]*See, e.g.*, United States v. Baller, 519 F.2d 463 (4th Cir.), *cert. denied*, 423 U.S. 1019 (1975) (dealing with voice spectrogram analysis to identify a speaker); United States v. Stifel, 433 F.2d 463 (6th Cir. 1970), *cert. denied*, 401 U.S. 994 (1971) (dealing with neutron activation analysis of bomb package fragments); People v. Kelly, 17 Cal. 3d 24, 549 P.2d 1240, 130 Cal. Rptr. 144 (1976) (dealing with use of spectrograms to analyze voice prints); People v. Williams, 164 Cal. App. 2d 858, 331 P.2d 251 (1958) (dealing with use of Nalline tests to detect the presence of narcotics in a person's body).

[63]*See, e.g.*, United States v. Baller, 519 F.2d 463 (4th Cir.), *cert. denied*, 423 U.S. 1019 (1975). A less rigorous evidentiary foundation was required in McKay v. State, 155 Tex. Crim. 416, 235 S.W.2d 173 (1951) (lack of unanimity of support goes only to the weight of the evidence).

expert witness be properly qualified to give an opinion on the subject,[64] but he must establish that some scientific profession "has put the principle to some use of its own, thus affording a thorough empirical testing of the principle."[65] The principle must have gained acceptance as a working tool in the particular field which experimented with it.[66] "The requirement of general acceptance in the scientific community assures that those most qualified to assess the general validity of a scientific method will have the determinative voice."[67] Additionally, the *Frye* requirement assures the existence of a minimal reserve of experts who can critically evaluate the novel technique as applied in a particular case, expose the limitations of the new theory, and impartially assess the position of the scientific community.[68]

2. Validity and Reliability of the Test Results.—An adequate foundation for the tests is crucial to prevent deception and misapplication of the theory; however, several courts have argued that any criticism of the developments should go to the *weight* of the evidence and not to its admissibility.[69] The court in *United States v. Stifel*[70] said that absolute certainty of result or unanimity of scientific opinion is not required for admissibility:

> [N]either newness nor lack of absolute certainty in a test suf-

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[64]*See*, United States v. Stifel, 433 F.2d at 438; People v. Kelly, 17 Cal. 3d at 30-31, 549 P.2d at 1244, 130 Cal. Rptr. at 148; Jones, *Danger—Voiceprints Ahead*, 11 AM. CRIM. L. REV. 549, 554 (1973); Strong, *supra* note 59, at 16. The expert's qualifications need to be established; furthermore, he must testify only as to areas within his demonstrated competence. *Id.* at 9-10. A sufficient foundation must also be laid concerning the application "of a scientific method, test, or process on a *particular occasion.*" *Id.* at 20 (emphasis added). The proponent of the evidence must demonstrate that correct scientific procedures were used in the particular case. *Id.* at 18-22. In United States v. Baller, 519 F.2d at 467, the court upheld a jury instruction warning the jurors to disregard the expert's testimony "if they decided his opinion was not based on adequate education or experience." *But see*, People v. Williams, 164 Cal. App. 2d at 860-62, 331 P.2d at 253-54 (the court stated that despite the fact that the expert witness had no personal knowledge of the drug used, the drug's general acceptance in the community overcame this problem).

[65]Strong, *supra* note 59, at 12. *See also* People v. Kelly, 17 Cal. 3d at 30-31, 549 P.2d at 1244, 130 Cal. Rptr. at 148; Huntingdon v. Crowley, 64 Cal. 2d 647, 414 P.2d 382, 51 Cal. Rptr. 254 (1966).

[66]Strong, *supra* note 59, at 12.

[67]United States v. Addison, 498 F.2d 741, 743-44 (D.C. Cir. 1974).

[68]*Id.*; United States v. Baller, 519 F.2d at 465; People v. Kelly, 17 Cal. 3d at 30-32, 37-38, 549 P.2d at 1244-45, 1248-49, 130 Cal. Rptr. at 148-49, 152-53.

[69]United States v. Franks, 511 F.2d 25, 33-34 (6th Cir.), *cert. denied*, 422 U.S. 1042 (1975); United States v. Stifel, 433 F.2d 431, 438 (6th Cir. 1970), *cert. denied*, 401 U.S. 994 (1971); People v. Kelly, 17 Cal. 3d 24, 31, 549 P.2d 1240, 1244, 130 Cal. Rptr. 144, 148 (1976); McKay v. State, 155 Tex. Crim. 416, 235 S.W.2d 173 (1951).

[70]433 F.2d 431, 438 (6th Cir. 1970), *cert. denied*, 401 U.S. 944 (1971).

> fices to render it inadmissible in court. Every useful new development must have its first day in court. And court records are full of the conflicting opinions of doctors, engineers and accountants, to name just a few of the legions of expert witnesses.[71]

Therefore, those opposing the admissibility of scientific tests can direct their criticism toward the weight given to such evidence. Although the trial judge initially has a large measure of discretion in admitting or refusing to admit evidence based on scientific processes, the jury must weigh the credibility of the expert's testimony after full consideration of its value and imperfections.[72] Indiana case law also supports admission of relevant evidence without regard to its weight or sufficiency.[73] In dealing with the admissibility of expert testimony the Fourth Circuit Court of Appeals in *United States v. Baller*[74] stated:

> In order to prevent deception or mistake and to allow the possibility of effective response, there must be a demonstrable, objective procedure for reaching the opinion and qualified persons who can either duplicate the result or criticize the means by which it was reached, drawing their own conclusions from the underlying facts.
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> . . . .
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> Unless an exaggerated popular opinion of the accuracy of a particular technique makes its use prejudicial or likely to mislead the jury, it is better to admit relevant scientific evidence in the same manner as other expert testimony and allow its weight to be attacked by cross-examination and refutation.[75]

Scientific evidence is particularly useful as a fact-finding tool if a proper evidentiary foundation has been laid; it is equally important, especially where mathematical probability or statistics are used, to ensure that data concerning the frequency of occurrence of certain events can be "subsequently and independently empirically verified."[76] This requirement of subsequent independent verification for the purpose of "either duplicat[ing] the result or criticiz[ing] the

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[71]*Id. Accord*, State v. Johnson, 42 N.J. 146, 171, 199 A.2d 809, 823 (1964); Strong, *supra* note 59, at 11.

[72]*See* note 69 *supra*.

[73]*See* Harbor v. Morgan, 4 Ind. 158 (1853).

[74]519 F.2d 463, 465 (4th Cir.), *cert. denied*, 423 U.S. 1019 (1975).

[75]*Id.* at 466.

[76]Liddle, *Mathematical and Statistical Probability As a Test of Circumstantial Evidence*, 19 CASE W. RES. L. REV. 254, 276 (1968).

means by which it was reached"[77] is also a guarantee that correct scientific procedures were used in the particular case.[78] Therefore, in order to meet the requirements of admissibility, the expert testimony must establish that the newly developed scientific process is founded on tangible demonstrative premises; such evidence must not be accepted unless there is an assurance that the tests have been conducted in accordance with the highest standards of care.

C. Admission of HLA Test Results as New Scientific Evidence

The revolution in paternity testing brought about by advancements in HLA tissue typing has induced the writing of various scientific and legal articles on the subject. Several of these authorities, in advocating the use of the test results as evidence of positive proof of paternity, have demonstrated the conformity of the HLA test methods with principles concerning admissibility of new scientific techniques.[79]

1. Acceptance of HLA Testing by the Scientific Community.—Support for the view that the scientific community has accepted HLA test results as a reliable predictor of paternity can be found from a number of sources. An overview of various scientific and legal articles illustrates the general awareness of and acceptance by the relevant scientific community of HLA testing as a reliable predictor of paternity.[80] The substantial weight of medical and legal authority attests to their accuracy and value.[81] In addition, a number of courts have already found that HLA results satisfy the *Frye* test.[82] This requirement is also demonstrated by the widespread use of HLA testing in areas of medical science other than paternity testing, namely in kidney or other organ transplants and in the diagnosis of certain diseases.[83]

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[77]United States v. Baller, 519 F.2d at 466.

[78]*See* note 64 *supra*.

[79]*See, e.g.*, S. SCHATKIN, *supra* note 11, §§ 8.06-.14; *AMA-ABA Guidelines*, *supra* note 11; Chakrabortz, Shaw & Schull, *supra* note 48; Ellman & Kaye, *supra* note 57; Krause, *supra* note 5; Lee, *supra* note 11; Salisbury, *supra* note 48; Shaw & Kass, *supra* note 5; Sterlek & Jacobson, *Paternity Testing with the Human Leukocyte Antigen System: A Medicolegal Breakthrough*, 20 SANTA CLARA L. REV. 511 (1980); Terasaki, *supra* note 11.

[80]*See* note 79 *supra*.

[81]*Id.*

[82]*See e.g.*, County of Fresno v. Superior Court, 92 Cal. App. 3d 133, 136-38, 154 Cal. Rptr. 660, 662-63 (1979); Cramer v. Morrison, 88 Cal. App. 2d 873, 153 Cal. Rptr. 865 (1979); Malvasi v. Malvasi, 167 N.J. Super. 513, 401 A.2d 279 (1979).

[83]*AMA-ABA Guidelines*, *supra* note 11, at 272-76. The HLA test has gained widespread acceptance for use in kidney transplants in the United States and Europe. Cramer v. Morrison, 88 Cal. App. 3d 873, 878, 153 Cal. Rptr. 865, 867 (1979); Terasaki

Finally, the widespread acceptance of serologic data in the estimation of likelihood of paternity is further documented by the European practice of admitting blood group evidence showing the probability that a named man is the father of a given child.[84] European laboratories have developed complex blood typing systems as well as safety procedures which assure accuracy of their results. The test results are reported to the court only if the probability is significantly high, above ninety-five percent, or significantly low, less than five percent.[85] Therefore, at the outer limits, this approach produces de facto inclusions or exclusions.[86] At the very least, it produces valuable circumstantial evidence. There is a general consensus among authorities[87] throughout the United States and Europe that HLA tissue typing is an accurate indicator of paternity exclusion and a reliable predictor of paternity inclusion. Thus, HLA typing has met one of the requirements for the admissibility of new scientific evidence—it is a practical working tool in a scientific field.

2. *Validity and Reliability of HLA Test Results.*—Likelihood of paternity must be calculated using probability factors. In HLA tissue typing, calculations of the probability that a mating of the known mother and a particular nonexcluded putative father would produce a child with the genetic markers in question are based on gene frequencies in a given population.[88] "Probabilities are assigned to the various possible genotypes using population statistics and then all possible combinations are considered in the calculation."[89] Ordinarily, the nonexcluded putative father is compared to a random man.[90] The probability that a mating of the mother with a randomly chosen man would produce a child with the genetic markers in question can also be calculated from the frequency of the markers in the

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& Mickey, *Histocompatibility—Transplant Correlation, Reproducibility, and New Matching Methods*, 3 TRANSPLANTATION PROC. 1057 (1971). "Progress in HLA typing is very rapid, principally because of the clinical importance of HLA. Survival of transplanted organs depends to a large extent on HLA compatability between the donor and recipient, . . . so there is great pressure to improve the efficacy [of] HLA typing." S. SCHATKIN, *supra* note 11, § 8.08 at 8-23.

[84]*AMA-ABA Guidelines*, *supra* note 11, at 252, 260-63; Chakrabortz, Shaw & Schull, *supra* note 48, at 477; Lee, *supra* note 11, at 616; Terasaki, *supra* note 11, at 544. The procedure of computing likelihood of paternity is currently practiced by national blood typing facilities in Oslo, Copenhagen, and Stockholm; great expertise has developed over several decades. UNIFORM PARENTAGE ACT § 12, Comment.

[85]*See* UNIFORM PARENTAGE ACT § 12, Comment; Krause, *The Uniform Parentage Act*, 8 FAM. L.Q. 1, 10-11 (1974).

[86]UNIFORM PARENTAGE ACT § 12, Comment.

[87]*See* note 79 *supra*.

[88]Terasaki, *supra* note 11, at 549.

[89]*Id.*

[90]*Id.*

general population.[91] The "blood group paternity index,"[92] by which the "*probability of paternity* for the putative father" is estimated, is equivalent to "the ratio of his probability to the sum of the probabilities for both men,"[93] both the putative father and the random hypothetical man.

Because HLA probability statistics are founded on objective empirically established data, they provide precise, reliable, mathematical conclusions and are not prone to the defects inherent in the type of mathematical probability used in the famous case of *People v. Collins*.[94] In *Collins*, the expert witness did not present "any statistical evidence whatsoever in support of the probabilities for the factors selected";[95] because the validity of the estimates had not been demonstrated, the mathematical probability statistics were not admissible as evidence to identify a defendant.[96]

The HLA interpretations are not based on arbitrarily assigned probability values, as in *Collins*, or on a statistical theory unsupported by the evidence. Instead, they are based on objectively ascertainable data capable of being reproduced and a statistical theory founded on extensive scientific research and experimentation. When a scientific

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[91]*Id.* The following articles provide a detailed, scientific coverage of how to calculate these probabilities: *AMA-ABA Guidelines*, *supra* note 11, at 262; Lee, *supra* note 11, at 630-33. *Accord*, UNIFORM PARENTAGE ACT § 12, Comment.

[92]UNIFORM PARENTAGE ACT § 12, Comment at 604.

[93]Terasaki, *supra* note 11, at 549. Terasaki modifies this premise even further:

> This paternity probability is a measure of likelihood based solely on serologic information *apart from any nongenetic evidence for or against paternity.* It should be noted that such analysis is not meaningful in distinguishing between two *related*, nonexcluded putative fathers. The most extreme example is identical twins, for whom all genetic markers are the same.

Id.

[94]68 Cal. 2d 319, 438 P.2d 33, 66 Cal. Rptr. 497 (1968). In this case, a mathematician was asked to testify as to the probability that a couple other than the defendants (man and woman with special characteristics) could be the culprits in the charged robbery. He testified that the probability was astronomically small (1/12,000,000). The Supreme Court of California held that, although there was a proper role for probabilistic evidence in the trial process, the evidence in the particular case was unduly prejudicial because of the invalidity of the evidentiary foundation upon which the probabilities were based. *Id.* at 327-29, 438 P.2d at 38-39, 66 Cal. Rptr. at 502-03. The *Collins* court concluded that this "trial by mathematics" so distorted the jury's role and so disadvantaged defense counsel as to constitute a miscarriage of justice. *Id.* at 332, 438 P.2d at 41, 66 Cal. Rptr. at 505.

For a more extensive analysis of the *Collins* case, see Cullison, *Identification by Probabilities and Trial by Arithmetic (A Lesson for Beginners in How to be Wrong with Greater Precision)*, 6 HOUS. L. REV. 471, 475-77 (1969); Jaffee, *supra* note 29, at 471-75; Liddle, *supra* note 76, at 264-65, 270-73; Tribe, *Trial by Mathematics: Precision and Ritual in the Legal Process*, 84 HARV. L. REV. 1329, 1334-38 (1971).

[95]People v. Collins, 68 Cal. 2d at 325, 438 P.2d at 36, 66 Cal. Rptr. at 500.

[96]*Id.* at 327-29, 438 P.2d at 38-39, 66 Cal. Rptr. at 502-03.

technique "is susceptible to subsequent verification, sophisticated devices are available for measuring or counting the frequency of occurrence of that event, and reliable probabilities may be empirically assigned by experts" in the area.[97] Requiring two or more laboratory determinations of the estimation of paternity would be an effective safeguard against possible errors and misapplication of the test results.

The general acceptance of HLA tissue typing by the relevant scientific community,[98] the clinical importance of HLA testing in the area of organ transplantation,[99] and the availability of probability statistics which can be subsequently and independently empirically verified[100] all point to the validity of such tests in establishing paternity.

IV. Arguments Favoring the Use of HLA Tests as Affirmative Evidence of Paternity

The introduction of HLA tissue typing has caused a revolution in paternity testing; extensive scientific experimentation has led to the discovery of a greater number of genetic markers and an increasing number of blood group systems. Currently, between fifty-seven and sixty-two tests of blood and other genetic products are capable of establishing within approximately a ninety-nine percent probability whether a named man is the father of a certain child.[101]

However, use of estimations based on HLA typing, like use of other scientific evidence, requires striking a balance between the probative worth of the evidence and its capacity to confuse or prejudice a jury. This function is even more essential in an era when scientific proof "assume[s] a posture of mystic infallibility in the eyes of a jury."[102] Proponents of the admission of nonexclusion test results argue that the new tests provide such a high degree of prob-

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[97]Liddle, *supra* note 76, at 274.

[98]*See* note 79 *supra*.

[99]*See* note 83 *supra*.

[100]*See AMA-ABA Guidelines*, *supra* note 11, at 262; Lee, *supra* note 11, at 630-33; Terasaki, *supra* note 11, at 549.

[101]*See* Lee, *supra* note 11, at 616, 628; Shaw & Kass, *supra* note 5, at 58-59. Dr. Lee explains that the white blood cell isoantigen (HLA) system alone provides a 76% chance of exclusion. Lee, *supra* note 11, at 628. If, in addition to HLA tests, tests on red blood cells, serum proteins, and all other known systems are included, the cumulative chance of exclusion for the nonfather is approximately 99%. *Id.* Although it is currently not practical to utilize all of these tests, many laboratories are now capable of routinely performing tests which establish at least a 70% chance of exclusion. *Id. See also AMA-ABA Guidelines*, *supra* note 11, at 252-56, 276; Terasaki, *supra* note 11, at 554.

[102]United States v. Addison, 498 F.2d 741, 744 (D.C. Cir. 1974).

ability that they outweigh any negative factors they may possess.[103] Although the tests do not provide a 100% certainty of paternity, the results should be admitted as *substantial probative evidence* with the expert who presents the information subject to cross-examination.[104] These measures of probability, properly and cautiously applied, could give a jury a scientific basis for the determination of paternity. "[I]n contrast to the subjective evidence upon which paternity is now often determined, tests such as HLA typing which generally provide high probabilities of paternity should certainly be preferred by the courts."[105]

The evidentiary value of these estimations increases as the percentage of probability approaches near certainty. "A particularly high statement of probability or improbability will have as much if not more probative force than a mere indication of probability or even medical certainty."[106] Probability statements that are neither very high nor very low, such as the probabilities established by the conventional red blood cell groupings, have only slight probative worth which is far outweighed by the chance that a juror would be unduly impressed by scientific evidence that he is incapable of fully understanding or evaluating.[107] Even though nonexclusionary test results based solely on the standard red blood cell systems are logically relevant evidence on the issue of paternity, most courts have excluded the test results because of their highly prejudicial effect on the putative father.[108] Likewise, the probative value of such evidence may be outweighed by the counterbalancing factors of jury

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[103]*See* Krause, *supra* note 5, at 261-63; Lee, *supra* note 11, at 630; Salisbury, *supra* note 48, at 66-67, 73-74; Shaw & Kass, *supra* note 5, at 42-43, 60; Sterlek & Jacobson, *supra* note 79 at 526-29; Terasaki, *supra* note 11, at 554.

[104]Shaw & Kass, *supra* note 5, at 60.

[105]Terasaki, *supra* note 11, at 554. *See AMA-ABA Guidelines*, *supra* note 11, at 283. The joint committee recognized the evidentiary value of probability estimations and recommended that new uniform legislation be enacted to "simplify the admissibility in evidence of test results and the probative effect thereof, including the evidentiary value of estimations of 'likelihood of paternity.'" *Id. See also* Krause, *supra* note 5, at 271-72. The author comments that the practice of comparing the resemblance of the child to the putative father had a very prejudicial effect on the jury; the jury gave considerable weight to such a comparison. *Id.* at 272.

[106]Broun & Kelly, *Playing the Percentages and the Law of Evidence*, 1970 U. ILL. L.F. 23, 36.

[107]*Id.* at 36-38; Salisbury, *supra* note 48, at 66.

[108]Dodd v. Henkel, 84 Cal. App. 3d 604, 148 Cal. Rptr. 780 (1978); People v. Nichols, 341 Mich. 311, 67 N.W.2d 230 (1954); State *ex rel.* Freeman v. Morris, 156 Ohio St. 333, 102 N.E.2d 450 (1951). *Contra*, Livermore v. Livermore, 233 Iowa 1155, 11 N.W.2d 389 (1943). Note that these cases deal only with the impact of the traditional red blood cell systems on the probability of paternity. *See also* cases collected in Annot., 46 A.L.R.2d 1000, 1022 (1956).

confusion and undue prejudice when the group of potential fathers is relatively large.[109]

Scientific breakthroughs in the identification and classification of blood factors have permitted a significant narrowing of the class of potential fathers by blood type; therefore, estimation of paternity based on HLA testing has attained such accuracy[110] that, arguably, probability calculations are of sufficient import to be brought to the attention of the jury despite the risk that they will be accorded too much weight. Dean McCormick points out, "The question is one of identity. Every identifying mark of the father, however common the trait, (so long as not universal) such as height, weight, color of hair, is relevant, and it is from the accumulation of identifying traits that circumstantial proof of identity gains its persuasive power."[111] The statistical probability that a named man is the father of a certain child should be considered together with other types of traditional circumstantial evidence; proof that the putative father belongs to the small group of potential fathers would be substantial corroborative proof that he was the actual father. Shaw and Kass[112] best summarize the highly probative worth and evidentiary value that HLA blood typing tests have on the resolution of paternity:

> If one man has been identified by the mother as the father, if there is reasonable corroborating evidence, and if science can say that only one man in a hundred of the population at large could be the father of the child in question and that the alleged father has the characteristics of that man, it is highly probable that a jury would find the preponderance of evidence required in civil cases.[113]

They go on to observe:

> [Juries] *should* be swayed by testimony that there is a 99 percent probability of paternity. All evidence is intended to sway a jury one way or another, and certainly scientific data of the kind presented in this paper should weigh more heavily than testimony from the memory of a neighbor. Conversely, to withhold such information from a jury is to deprive it of crucial and material facts without which the picture of truth must be incomplete. Admission of high probability non-

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[109]Phillips v. Jackson, 615 P.2d 1228 (Utah 1980); Broun & Kelly, *supra* note 106 at 37.

[110]*See* note 11 *supra*.

[111]C. McCORMICK, *supra* note 17, § 211 at 522.

[112]Shaw & Kass, *supra* note 5, at 41.

[113]*Id.* at 42-43. *See also* Collins v. Wise, 156 Ind. App. 424, 296 N.E.2d 887 (1973) in which the court determined that civil actions to establish paternity "need only be proved by a preponderance of the evidence." *Id.* at 426, 296 N.E.2d at 889.

exclusion evidence will surely benefit illegitimate children and falsely accused men as well as the tax-paying public.[114]

These recent scientific breakthroughs in blood and tissue group identification and classification signal revisions in the rules of evidence in paternity proceedings. Demands upon the accuracy and efficiency of the fact-finding process are increasing with the rapid development of novel scientific techniques. Several medical and legal authorities strongly recommend that blood and tissue typing results should be admissible as evidence even though an exclusion is not established.[115] The results "should be entitled to whatever weight the fact that an exclusion was not established in a particular case should have—and that weight should be computed by an expert in terms of statistical probabilities."[116] If only a small percentage, for example five percent or less, of a random sample of men are not excluded as possible fathers, then the fact that the putative father is not excluded by the test results is of considerable significance, especially if other circumstantial evidence indicates the possibility that he fathered the child.[117]

Accordingly, blood and tissue typing results estimating probability of parentage should be given the same weight as other types of circumstantial evidence; in most cases, the cumulative effect of this proof can establish with near 100% certainty that a named man is the father. As Professor Liddle points out, mathematical probability is most useful in "identifying certain individuals . . . by showing the correlation between or similarity of certain physiological, *genetic*, psychic, or other characteristics of the individual and certain like characteristics known to . . . have been related to the event in question."[118] In view of the recent scientific progress in paternity testing, courts should reassess their stand on the admission of statistical evidence to prove the likelihood of paternity. Certainly, its use in paternity proceedings will greatly enhance the accuracy and efficacy of the fact-finding process.

Recent improvements in blood and tissue group testing might also have an important impact on another aspect of paternity litigation. In addition to their use in the courtroom, HLA test results could be effectively used as a settlement tool to avoid paternity litigation altogether.[119] If the HLA test result gave a ninety-eight or ninety-nine percent assurance that the defendant was the father,

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[114]Shaw & Kass, *supra* note 5, at 60.

[115]*See* note 79 *supra*.

[116]Krause, *supra* note 5, at 261.

[117]*Id.*; Sterlek & Jacobson, *supra* note 79, at 526.

[118]Liddle, *supra* note 76, at 277 (emphasis added).

[119]*See* County of Fresno v. Williams, 92 Cal. App. 3d 133, 136-37, 154 Cal. Rptr. 660, 662 (1979).

and if other circumstantial evidence pointed to the defendant's paternity, a putative father would probably be persuaded to avoid litigation and seek a compromise settlement. Arguably, use of the HLA system would have the effect of decreasing the number of paternity suits while still imposing upon the father the obligation of supporting his child.

V. Arguments Opposing the Use of HLA Tests as Affirmative Evidence of Paternity

A. Countervailing Factors

Opponents of HLA tests as positive proof of paternity argue that the probative value of the evidence is substantially outweighed by a number of countervailing factors such as its misleading effect on the jury, unfair prejudice to the putative father, and an undue burden on the court system.[120] Additionally, opponents allege a high error rate and a paucity of qualified experts. The possible dangers cited are in large part the same ones considered in admitting mathematical scientific evidence in general.[121]

1. Misleading Effect on the Jury.—The first risk in allowing expert testimony based on complex scientific or mathematical evidence is the danger that the jury will give unmerited weight and effect to such evidence.[122] Because of the highly technical nature of most mathematical or scientific proof, the jury—and at times the judge and counsel—often has difficulty in analyzing the evidence correctly and combining it intelligently with the remaining evidence.[123] The impressiveness of statistics and the infallibility normally associated with objective scientific proof tempt the jury to assign such evidence disproportionate weight; additionally, the jury may be unable to logically assess the relevance and value of the testimony.[124] In *People v. Collins*,[125] the California Supreme Court warned that "[m]athematics, a veritable sorcerer in our computerized society, while assisting the trier of fact in the search for truth, must not [be allowed to] cast a spell over him."[126] Professor Tribe warns,

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[120]Jaffee, *supra* note 29, at 468-85; Wiener & Socha, *Methods Available for Solving Medicolegal Problems of Disputed Parentage*, 21 J. For. Sci. 42, 61, 63 (1975). *See also* Tribe, *supra* note 94, at 1329-78.

[121]For a review of the most common counterbalancing factors which preclude the application of scientifically competent evidence, see text accompanying notes 51-57 *supra*.

[122]*See* Ellman & Kaye, *supra* note 57, at 1143-58; Tribe, *supra* note 94, at 1329-78.

[123]Tribe, *supra* note 94, at 1332-38.

[124]*Id.*

[125]68 Cal. 2d 319, 438 P.2d 33, 66 Cal. Rptr. 497 (1968).

[126]*Id.* at 320, 438 P.2d at 33, 66 Cal. Rptr. at 497.

however, that scientific evidence should not be eliminated completely from the legal process; "the drawing of unwarranted inferences from expert testimony has long been viewed as rectifiable by cross-examination, coupled with the opportunity to rebut."[127] A trier of fact should not be deprived of the value of scientific data merely because it is highly technical and complicated.[128]

2. Unfair Prejudice to the Defendant.—Also inherent in the application of scientific and mathematical principles to the legal system is the danger that the jury will arrive at a premature conclusion about the defendant's guilt.[129] In order to make an independent and more accurate assessment of the putative father's paternity, the trier of fact normally suspends judgment until it has heard and carefully weighed all arguments in favor of the defense.[130] Yet, use of HLA data as independent direct-examination evidence on the ultimate issue of paternity forces the trier of fact to arrive at an estimate of the likely truth near the trial's start, long before he has had the opportunity to consider other circumstantial evidence.[131] Although statistical data to prove paternity inclusion may be relevant, it must be considered in conjunction with nonscientific evidence which does not carry with it the same risks.[132] Arguably, the use of HLA results and probability statistics to the exclusion of the more conventional forms of evidence in a paternity action impedes the effective presentation of the putative father's defense. In such a case, the unfairness and prejudice to the defendant would substantially outweigh any probative value the scientific proof may have. Professor Jaffee proposes several safeguards for the employment of HLA test results at trial.[133] One appropriate safeguard he notes, is to de-emphasize the statistical basis by disclosing it at other stages of the trial, such as on redirect, cross-examination, or rebuttal:

> A jury can distinguish rebuttal rehabilitation from direct examination in a main case, and act accordingly. Having heard . . . a much-evidenced dispute move rather methodically *to a narrow focus on the credibility of plaintiff's expert*, a jury would be able to put the attendant evidence in the right logical place.[134]

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[127]Tribe, *supra* note 94, at 1338.

[128]*See* Ellman & Kaye, *supra* note 57, at 1161-62 (suggesting the use of simplified but thorough probability charts during trial to reduce the confusion which scientific data engenders).

[129]Tribe, *supra* note 94, at 1368-72.

[130]*Id.* at 1371.

[131]*Id.* at 1368-71. *See also* Jaffe, *supra* note 29, at 468-85.

[132]*See* C. McCormick, *supra* note 17, § 185 at 439 n.30.

[133]Jaffee, *supra* note 29, at 484-85.

[134]*Id.* at 485 (emphasis added).

Paternity test results can be "legally relevant" only if they are used to corroborate independent evidence, such as testimony that the defendant had sexual relations with the mother at the critical time.[135] In order to ensure that the trier of fact does not view the HLA results as conclusive evidence of paternity, the test results should be introduced as one of the many factors that formed the basis for the expert's opinion.[136] This evidence would, therefore, not be used as substantive evidence to prove the issue of paternity but merely as secondary evidence focusing upon the credibility of the expert's opinion.[137] Used in this way, HLA data would more closely approximate its proper function in the judicial process—as relevant evidence to be rationally analyzed by the trier of fact.

3. Undue Burden on the Court System.—Those opposing the admissibility of HLA test results also claim that this evidence places an undue burden on the court system. According to some authorities, the HLA testing procedure is "beset with numerous pitfalls,"[138] thereby reducing its utility to the courts:

> [F]ew laboratories if any are equipped to carry out all the necessary tests, and it is doubtful that any single individual is fully qualified to carry out and interpret all the tests. In addition, the high cost of a "complete" test makes it prohibitive and impractical. A more serious difficulty is the real possibility of mistakes, which increases in likelihood as the variety and number of test procedures increase, thus raising the danger of miscarriage of justice.[139]

A major criticism of the HLA testing procedure is that few laboratories are capable of performing the more than fifty tests required for a ninety-nine percent inclusion.[140] In response, the Joint AMA-ABA Committee proposed that steps be taken to identify and make a list of accredited facilities qualified to perform the full series of blood and tissue tests.[141] Placing qualified laboratories in centralized locations throughout the country, along with the creation of uniform procedures for identifying mailed specimens, would help to alleviate the shortage of laboratories competent to perform the tests.[142]

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[135]*Id.* at 480-81.

[136]*Id.* at 478-79.

[137]*Id.* at 468, 476, 478-79.

[138]Wiener & Socha, *supra* note 120, at 61.

[139]*Id.* at 63.

[140]*Id.* at 61, 63; Lee, *supra* note 11, at 628; Polesky & Krause, *Blood Typing in Disputed Paternity Cases—Capabilities of American Laboratories*, 10 FAM. L.Q. 287, 289-93 (1976).

[141]*AMA-ABA Guidelines*, *supra* note 11, at 283; Shaw & Kass, *supra* note 5, at 59.

[142]*AMA-ABA Guidelines*, *supra* note 11, at 280-83.

In addition, the cost of performing all of these tests makes their routine use in disputed paternity cases unrealistic.[143] Although the cost may vary, the entire battery of fifty-seven to sixty-two tests costs approximately $150 per person,[144] approximately five times the cost of the standard red blood cell grouping test.[145] If a state or county were required to assume the additional cost of the HLA tests in each case where a party claimed he was financially unable to bear this substantial expense, potential burden on the public purse would be extreme.[146] Arguably, the financial gains made by shifting the child support burden from welfare agencies to the responsible father could be offset by the burden placed on welfare agencies in subsidizing the considerable cost of these additional tests.

Although "employment of this entire battery of tests would require a magnitude of time, money and skill that would make it prohibitive in routine cases,"[147] in many instances the common blood tests would be sufficient.[148] The AMA-ABA report stated that it is not necessary to utilize the entire set of tests once an exclusion had definitely been reached.[149] The Guidelines recommended that testing proceed in stages, with the more general tests, ABO, Rh, and MNSs systems, first; if no exclusion is produced in the first round, three additional screenings, the Kell, Duffy, and Kidd systems, could then be performed.[150] The probability of excluding a man who is not the father ranges from sixty-three to seventy-two percent, depending on race, when these six systems are used.[151] "In the event no exclusion is produced at that stage, additional testing using the HLA system . . . may be done to raise the mean probability of exclusion to at least the ninety percent level."[152] Therefore, the full spectrum of tests should only be utilized in exceptional cases.

Some commentators point out that discretion and common sense should prevail in deciding whether the parties should be tested under the expensive HLA system:

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[143]Wiener & Socha, *supra* note 120, at 61.

[144]Shaw & Kass, *supra* note 5, at 58.

[145]Moore v. Astor, 102 Misc. 2d 472, 474, 423 N.Y.S.2d 1010, 1012 (Fam. Ct. 1980).

[146]*Id. See also* Commissioner of Social Servs. v. Lardeo, 100 Misc. 2d 220, 224, 417 N.Y.S.2d 665, 669 (Fam. Ct. 1979).

[147]Shaw & Kass, *supra* note 5, at 59.

[148]*Id.* at 60.

[149]*AMA-ABA Guidelines*, *supra* note 11, at 256.

[150]*Id.* For a good general discussion of the ABO, Rh, MNSs, Kell, Duffy, and Kidd blood group systems, see *id.* at 263-72.

[151]*Id.*

[152]*Id.*

> Common sense must be used. Lawyers should look at the entire fact situation with which they are faced, considering such evidence as length of gestation, access of the putative father to the mother, access of other men, and the character of the parties. Only if they are left with a sharp controversy should they turn to science with its fullest potential for approaching truth.[153]

Arguably, costly HLA testing need not be done if the other six systems show exclusion or if other factors independently establish strong proof of paternity or nonpaternity. Thus, criticisms that HLA testing is too expensive for routine use are largely undermined.

4. High Error Rate.—Opponents also allege that the HLA process has a high error rate and may result in misclassification. Commentators indicate that the HLA tests "are reputed to have the reproducibility of only about 90%, so that the possibility of errors is a real one indeed."[154] They also note that the introduction of complicated and sophisticated testing procedures increases the "possibility of errors."[155] Possible mistakes which are likely to endanger the accuracy of the tests are taking a sample from someone other than the person to be tested, incorrect storage practices, and use of the wrong antisera.[156] With the increase in the variety and number of testing procedures, the possibility of making such errors would also increase. It is strongly recommended that additional research and experimentation in paternity testing are needed "to improve the reliability and reproducibility of the existing tests."[157]

5. Scarcity of Qualified Experts.—There is also a problem in finding and training qualified experts to insure that all tests are carried out correctly and that the test results are properly interpreted.[158] The Utah Supreme Court in the recent case of *Phillips v. Jackson*[159] held that the trial court erred in admitting the results of the new HLA tests.[160] Although the court recognized the abundance of scientific literature lauding the validity of the tests and their widespread acceptance in medical circles,[161] it held that the expert witness failed to establish a proper foundation at trial for the admissibility of the test results. The court stated:

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[153]Shaw & Kass, *supra* note 5, at 59.

[154]Wiener & Socha, *supra* note 120, at 61.

[155]Shaw & Kass, *supra* note 5, at 57.

[156]*Id.* at 58.

[157]Lee, *supra* note 11, at 633.

[156]*Id.*; Shaw & Kass, *supra* note 5, at 57; Wiener & Socha, *supra* note 120, at 63.

[159]615 P.2d 1228 (Utah 1980) (3-2 decision).

[160]*Id.* at 1238.

[161]*Id.* at 1235-36.

> [T]he articles are not sufficient, absent expert testimony, for this Court to determine as a matter of law the issue of general admissibility, especially in view of the paucity of legal opinions on this point. The articles require expert interpretation and elaboration. It is not clear, for example, that they all define the HLA test in the same manner, or require that the same procedures be followed to achieve the degree of reliability claimed. . . . In short, there are numerous unanswered questions which should be addressed by expert testimony to lay the necessary foundation.[162]

The court further noted that the expert witness' testimony was "too general, too vague, and too unrelated to the specific requirements for establishing a foundation for the test . . . ."[163] The expert did not "indicate how the table of percentages used to establish paternity probabilities was [calculated]."[164] In addition, there was no evidence in the record to establish the witness' expertise either in the theory or in the special procedure. In fact, he had no technical background or training in the area, nor did he have a special familiarity with the scientific literature on the subject.[165] The general statement that the HLA method has achieved wide scientific acceptance is insufficient, without more, to lay the necessary foundation. Whether an adequate evidentiary foundation was established is a mixed question of law and fact.[166] Furthermore, the expert witness was unqualified to interpret the test results and to establish that the actual method employed in the particular case was performed in accordance with proper procedures and with proper materials and equipment.[167]

The scarcity of well-informed, qualified experts to testify both as to the validity of the HLA tests in general and to the correctness of the procedure in the particular case makes courts hesitant to admit the test results into evidence absent a specific showing as to their reliability and preciseness. Although HLA typing is considered "highly reliable when performed under carefully controlled conditions by laboratories that perform quality control checks,"[168] the insufficient number of qualified experts to carry out and interpret the tests weakens their validity and probative worth. Without a reserve of qualified experts available to expose the limitations of the HLA

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[162]*Id.* at 1236.

[163]*Id.*

[164]*Id.* at 1236-37.

[165]*Id.*

[166]*See* Cramer v. Morrison, 88 Cal. App. 3d 873, 887-88, 153 Cal. Rptr. 865, 873-74 (1979).

[167]Phillips v. Jackson, 615 P.2d at 1235-36.

[168]Terasaki, *supra* note 11, at 548.

technique in general and the flaws in the specific case, the tests may attain exaggerated importance in the fact-finding process.[169] In order to avoid these pitfalls and establish a valid evidentiary foundation, counsel should actively seek out qualified experts who can objectively criticize and point out the possible defects in the procedure, thereby exposing its shortcomings and enabling the trier of fact to more sensibly evaluate its relevance and probative worth.[170]

Another possible solution is the establishment of centralized, special institutes devoted solely to blood and tissue typing.[171] "Such central reference institutes could overcome the problem of training qualified experts, producing and standardizing antiserums and other reagents . . . ."[172] Presently, courts may be justified in their reluctance to admit results of HLA tissue typing tests because of the scarcity of competent facilities to perform the tests and the lack of qualified experts to interpret their results; the degree of preciseness of evidentiary foundations would vary considerably from jurisdiction to jurisdiction. With the advent of centralized, accredited laboratories, however, to train qualified experts, to standardize testing procedures, to develop acceptable laboratory quality control, and to improve the reliability and reproducibility of the tests, the courts should be less reluctant to admit the results as evidence of positive proof of paternity. The high evidentiary value given to the tests would be more justified as the accuracy of the tests increased; their probative worth would definitely outweigh any potential risks of jury confusion and undue burden on the court system.

VI. Judicial Reaction to HLA Testing

There have been no Indiana cases admitting evidence on the statistical likelihood of paternity.[173] Nor have the courts interpreted the extent of change occasioned by the amendment of Indiana Code section 31-6-6.1-8. However, several other jurisdictions have acknowledged the scientific community's acceptance of the HLA tests as accurate and reliable predictors of paternity and nonpaternity,[174] and a few courts have held such proof admissible as highly

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[169]United States v. Baller, 519 F.2d 463, 466 (4th Cir.), *cert. denied*, 423 U.S. 1019 (1975); United States v. Addison, 498 F.2d 741, 743-44 (D.C. Cir. 1974); People v. Kelly, 17 Cal. 3d 24, 30-32, 37-40, 549 P.2d 1240, 1244-45, 1248-50, 130 Cal. Rptr. 144, 148-49, 152-54 (1976).

[170]*See* notes 59 & 64 *supra* and accompanying text.

[171]*See* Wiener & Socha, *supra* note 120, at 63.

[172]*Id.*

[173]Recall that Indiana courts have only allowed blood test evidence to exclude a man from paternity. *See* note 19 *supra*.

[174]*E.g.*, Simons v. Jorg, 384 So. 2d 1362 (Fla. Dist. Ct. App. 1980); Commonwealth v. Blazo, 406 N.E.2d 1323 (Mass. Ct. App. 1980); Malvasi v. Malvasi, 167 N.J. Super.

probative evidence.[175] The courts often cite medical and legal journals which laud the HLA tests as an improved and dependable method for ascertaining paternity.[176] However, even the progressive courts recognize that new developments in paternity testing must have an adequate evidentiary foundation in order to be admitted as evidence.[177]

California is the pioneer state in utilizing all evidentiary aspects of HLA tissue typing. In the landmark case of *Cramer v. Morrison*,[178]

513, 514, 401 A.2d 279, 280 (1979). In Simons v. Jorg, 384 So. 2d 1362 (Fla. Dist. Ct. App. 1980), although it did not reach the question of the admissibility of HLA test results at trial nor decide the weight to be accorded such medical evidence at trial, the court upheld the trial court's decision that, based on the "undisputed" evidence of the test's reliability and accuracy, the party seeking to establish paternity showed sufficient good cause to require the putative father to submit to such a test. *Id.* at 1363. In Commonwealth v. Blazo, 406 N.E.2d 1323 (Mass. Ct. App. 1980), the appellate court upheld the trial court's refusal to order additional blood tests for the defendant, the mother, and the child since the refusal was founded on the inconclusive red blood cell groupings and since the HLA test had not been generally recognized and accepted at this time. In dicta, though, the court favored the use of HLA tests in the future:

> In view of the high level of accuracy, now attained from the HLA test and its recognition and general acceptance by the scientific and medical community since the date of this trial, in any contested paternity case arising hereafter when the putative father requests the HLA test, the judge should carefully consider in the exercise of his or her sound discretion ordering the administration of the HLA test to the defendant, the mother and the child.

Id. at 1326. *See also* Phillips v. Jackson, 615 P.2d 1228 (Utah 1980); Marticorena v. Miller, 597 P.2d 1349 (Utah 1979) (Maughan, J., dissenting) (Justice Maughan advocated a remand for a new trial on the paternity issue in view of the accuracy and highly probative nature of the new HLA tests which were unavailable to the parties at the time of the first trial).

[175]County of Fresno v. Williams, 92 Cal. App. 3d 133, 154 Cal. Rptr. 660 (1979); Cramer v. Morrison, 88 Cal. App. 3d 873, 153 Cal. Rptr. 865 (1979); Michael B. v. Amanda B., 86 Cal. App. 3d 1006, 150 Cal. Rptr. 586 (1978); Carlyon v. Weeks, 387 So. 2d 465 (Fla. Dist. Ct. App. 1980); Malvasi v. Malvasi, 167 N.J. Super. 513, 401 A.2d 279 (1979). *Contra*, Jane L. v. Rodney B., 103 Misc. 2d 9, 425 N.Y.S.2d 235 (Fam. Ct. 1980); Moore v. Astor, 102 Misc. 2d 472, 423 N.Y.S.2d 1010 (Fam. Ct. 1980); Goodrich v. Norman, 100 Misc. 2d 33, 421 N.Y.S.2d 285 (Fam. Ct. 1979); Commissioner of Social Servs. v. Lardeo, 100 Misc. 2d 220, 417 N.Y.S.2d 665 (Fam. Ct. 1975).

[176]*See* Cramer v. Morrison, 88 Cal. App. 3d at 887-88, 153 Cal. Rptr. at 874; Commissioner of Social Servs. v. Lardeo, 100 Misc. 2d at 220, 417 N.Y.S.2d at 666-67, 669. The *Cramer* court remanded the case for a factual determination as to whether the foundational requirements were met in the particular case. Although the numerous legal and scientific publications established the tests' validity and their general acceptance in the scientific community as a matter of law, a full determination of whether the foundational predicate was met also presented a question of fact to be ascertained from the testimony of qualified experts in the field. Cramer v. Morrison, 88 Cal. App. 3d at 886-89, 153 Cal. Rptr. at 873-74.

[177]Cramer v. Morrison, 88 Cal. App. 3d at 885-89, 153 Cal. Rptr. at 872-74; County of Fresno v. Williams, 92 Cal. App. 3d at 138, 154 Cal. Rptr. at 663; Carlyon v. Weeks, 387 So. 2d at 467-68; Malvasi v. Malvasi, 167 N.J. Super. at 515, 401 A.2d at 280.

[178]88 Cal. App. 3d 873, 153 Cal. Rptr. 865 (1979).

the California Court of Appeals reversed the trial court's grant of the defendant's motion in limine and said that the results of HLA tests could be received as probative evidence showing likelihood of paternity.[179] The court held that it was irrelevant that the California legislature, when it adopted the Uniform Act on Blood Tests to Determine Paternity,[180] omitted part of section 4 which allows the admission in evidence of blood test results to show probability of paternity.[181] It interpreted the omission to refer not to the sophisticated HLA test but to the standard Landsteiner blood grouping tests which were in use when the Uniform Act was adopted in California.[182] The *Cramer* court was so convinced that the test results would enhance the accuracy and impartiality of the paternity suit that it independently admitted this scientific evidence since the statute failed to exclude *HLA* results as evidence of paternity.[183]

The crucial question, however, was whether the probative value of the evidence outweighed its prejudicial effect. The *Cramer* court allowed the use of HLA tests to determine probability only after a deliberate balancing of the probative worth of such evidence and the dangers of unfair prejudice to the other party.[184] The court noted that the plaintiff most likely would have established the requisite evidentiary foundation for the admissibility of the HLA test had the motion in limine not been erroneously granted.[185]

In order to demonstrate the validity of the HLA test as a reliable indicator of paternity and its acceptance by the scientific community, the plaintiff called Dr. Paul Terasaki as an expert witness and also introduced various medical and legal journals to document the general acceptance of the test.[186] As a leading expert in the United States in the field of tissue typing and blood testing, Dr. Terasaki was well-qualified to testify concerning both the reliability of the HLA test as an indicator of paternity and its general acceptance in the scientific world.[187] Additionally, because Dr. Terasaki performed the HLA test on blood samples taken from the mother, the child, and the defendant,[188] he was well-qualified to

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[179]*Id.* at 880, 884-89, 153 Cal. Rptr. at 868, 871-74.

[180]*See* note 38 *supra.*

[181]88 Cal. App. 3d at 880-83, 153 Cal. Rptr. at 868-71.

[182]*Id.*

[183]*Id.*

[184]*Id.* at 884-85, 153 Cal. Rptr. at 872.

[185]*Id.* at 888-89, 153 Cal. Rptr. at 874.

[186]*Id.* at 885-88, 153 Cal. Rptr. at 872-74.

[187]*Id.* at 877-78, 886-88, & n.19, 153 Cal. Rptr. at 867, 873-74 & n.19.

[188]*Id.* at 877, 153 Cal. Rptr. at 867.

demonstrate that proper procedures were used.[189]

The court of appeals, also held that the defendant was precluded from attacking the foundational predicate of the HLA test because the defendant specifically indicated to the trial court that he did not base his motion in limine on the ground that the test had not attained general acceptance in the scientific community.[190] Not only was the *Cramer* court convinced of the existence of valid scientific bases for the HLA data, but it was also convinced that the highly relevant and probative worth of the evidence outweighed the dangers inherent in its introduction.[191]

The court found that such readily obtainable genetic evidence could provide a more precise and objective basis for ascertaining paternity than could the "flimsy" subjective evidence by which paternity has been determined in the past.[192] The *Cramer* court reasoned that the dramatic increase in the accuracy with which probabilities can be determined requires the use of HLA test results in order to enhance the empirical qualities of paternity proceedings.[193] The court concluded, "'[t]he more substantial the probative value of relevant evidence, the greater must be the danger of prejudice to an adverse party, in order to justify a finding that the probative value is substantially outweighed by the danger of undue prejudice.'"[194]

The *Cramer* court's reasoning can be extended a step further. Because HLA tests combined with the conventional red blood cell groupings can establish inclusion with 95% accuracy, they are the best available scientific evidence on the issue of paternity. A man not definitely excluded after complete testing will undoubtedly be the actual father, given other credible testimony that he had a relationship with the natural mother.[195] Excluding such competent scientific evidence on the paternity issue would greatly undermine the integrity of the legal process and would perpetuate the uncertainties of fatherhood which still exist despite a judicial finding of paternity or nonpaternity.[196]

The California Court of Appeals in *County of Fresno v. Superior*

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[189]*See* People v. Kelly, 17 Cal. 3d 24, 30, 549 P.2d 1240, 1244, 130 Cal. Rptr. 144, 148 (1976).

[190]88 Cal. App. 3d at 887-88, 153 Cal. Rptr. at 873-74.

[191]*Id.* at 884-85, 153 Cal. Rptr. at 872.

[192]*Id.* at 885, 153 Cal. Rptr. at 872.

[193]*Id.* In *Cramer*, Dr. Terasaki determined that there was a 98.3% probability that defendant was the father. *Id.*

[194]88 Cal. App. 3d at 884-85, 153 Cal. Rptr. at 872 (citing Jefferson, *California Evidence Benchbook* § 22.1 at 289 (1972)).

[195]*See* Jane L. v. Rodney B., 103 Misc. 2d 9, 10, 425 N.Y.S.2d 235, 236 (Fam. Ct. 1980).

[196]*See generally* note 174 *supra* and accompanying text.

Court[197] indicated that "public policy favors the use of objective highly accurate scientific analysis."[198] The court reasoned that a more sophisticated and exact test aids the court in "the difficult search for the truth";[199] to the extent that it "contributes to the resolution of the paternity issue, it may reduce the embarrassment of usual discovery procedures concerning conception."[200]

The same court in *Michael B. v. Superior Court*[201] advocated the admissibility of the HLA test as affirmative evidence:

> Even when the test does not exclude a defendant from being the possible father, it could be a significant factor to be considered by the parties in facilitating resolution of cases, particularly where there is limited evidence on the paternity issue and the particular test is helpful in determining statistical probabilities of paternity.[202]

The traditional policies of preserving the family and reducing doubts about parentage still continue to control.[203] As the California Supreme Court stated in *Salas v. Cortez*,[204] "[T]he state owes it to the child to ensure that an accurate determination of parentage will be made."[205] Considering the interests at stake, the question of paternity should be dealt with empirically by use of available genetic data.

Two recent cases have, however, questioned the propriety of admitting HLA test results to establish paternity, thereby demonstrating the judiciary's hesitation to revise the conventional rules of evidence to conform with modern scientific advances in the absence of specific legislative authorization or adequate safeguards. In *J.B. v. A.F.*[206] the Wisconsin Court of Appeals held that although "HLA testing has dramatically increased the accuracy with which probabilities can be determined,"[207] HLA test results could not be admissible as evidence to establish paternity under present Wisconsin law. The court reasoned that such an authorization would in effect "work an amendment"[208] because the Wisconsin paternity statute specifically

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[197]92 Cal. App. 3d 133, 154 Cal. Rptr. 660 (1979).
[198]*Id.* at 138, 154 Cal. Rptr at 663.
[199]*Id.*
[200]*Id.*
[201]86 Cal. App. 3d 1006, 150 Cal. Rptr. 586 (1978).
[202]*Id.* at 1009-10, 150 Cal. Rptr. at 588.
[203]*See* Cramer v. Morrison, 88 Cal. App. 3d at 885, 153 Cal. Rptr. at 872.
[204]24 Cal. 3d 22, 593 P.2d 226, 154 Cal. Rptr. 529, *cert. denied*, 444 U.S. 900 (1979).
[205]*Id.* at 34, 593 P.2d at 234, 154 Cal. Rptr. at 537.
[206]92 Wis. 2d 696, 285 N.W.2d 880 (Wis. Ct App. 1979).
[207]*Id.* at 703, 285 N.W.2d at 883.
[208]*Id.* at 705, 285 N.W.2d at 884.

allowed blood test results as evidence "only in cases where definite exclusion of any person [was] established."[209] The court interpreted the term "blood tests" to include both the standard red blood cell groups and also the new HLA tests and was reluctant to incorporate new scientific developments into the legal process, waiting instead for specific legislative approval.

In *Phillips v. Jackson*,[210] the Supreme Court of Utah held that HLA test results were inadmissible as evidence proving paternity,[211] although the Utah statute allowed the affirmative use of blood tests, subject to the court's discretion.[212] The Utah Supreme Court, exercising its discretion, concluded that an adequate foundation regarding the accuracy and reliability of the tests had not been laid. Although the court was aware of various scientific and medical journals commending the validity of the HLA tests, it restrictively held that the tests fell below the legal standards required for the admissibility of scientific evidence.[213] The court maintained that the expert witness was not qualified to elucidate the scientific literature on the subject or to interpret the actual test results.[214] The record did not establish the witness' expertise either in the theory or in the special procedure. Even with this favorable state statute, the *Phillips* court was cautious in integrating recent scientific developments into the factual determination of the paternity issue as long as there was even the slightest question regarding their accuracy and evidentiary value.

VII. CONCLUSION

With the present increase in the importance of paternity litigation, the need for accurate, reliable paternity tests will also in-

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[209]WIS. STAT. § 885.23 (1966). However, since the case of J.B. v. A.F., 92 Wis. 2d 696, 285 N.W.2d 880 (Wis. Ct. App. 1979), this statute has been amended (effective July 1, 1981) to allow blood test results to "be receivable as evidence in any case where exclusion from parentage is established *or where a probability of parentage is shown to exist.*" WIS. STAT. § 885.23 (West Supp. 1980-1981) (emphasis added). The Wisconsin legislature, in enacting this amendment, apparently considered the dicta in *J.B. v. A.F.* favoring revision of the rules of evidence to include statistical estimates of the likelihood of paternity. It will be interesting to observe how the Wisconsin courts will apply this amendment, for it is as vague as the Indiana one in establishing specific guidelines for the courts.

[210]615 P.2d 1228 (Utah 1980).

[211]*Id.* at 1238.

[212]UTAH CODE ANN. § 78-45a-10 (1977). Section 10 provides in part: "If the experts conclude that the blood tests show the possibility of the alleged father's paternity, admission of this evidence is within the discretion of the court, depending upon the infrequency of the blood type." *Id.*

[213]615 P.2d at 1235-38.

[214]*Id. See also* text accompanying notes 158-67 *supra.*

crease. The validity of HLA tissue typing as an effective means of establishing paternity exclusion and inclusion with a high degree of conclusiveness is being more widely accepted in both medical and legal circles, and appropriate revisions in the law of evidence will no doubt be made as the courts become more willing to admit probabilistic proof of paternity.

With the greater use of complex scientific evidence in the legal process, however, safeguards need to be developed in order for such technical data to be properly interpreted and applied in the courtroom. The medical and legal professions must work together so that sophisticated scientific information can be responsibly and intelligently used in the courts.[215] Statistical data estimating the likelihood of paternity is so highly probative on the crucial issue of paternity that it would be unfair to totally prohibit its use because of the risk that the jury will misconstrue its worth and give it unmerited weight. Cautionary jury instructions should be devised to warn the jurors that probabilistic data should not be the sole deciding factor on the issue of paternity; it should be used to corroborate other, more conventional forms of circumstantial evidence. Application of scientific proof should also be restricted to cross-examination and rebuttal in order to prevent premature conclusions before the rest of the evidence has been presented. If, in addition to these safeguards, advance notice is given to the adversary of the intent to use HLA tests as proof, and if "some provision for publicly financed expert assistance to the indigent accused confronted with an expert adversary"[216] is made, there will be little if any prejudice to the putative father. No undue burden on the judicial system will result by admitting these highly probative and reliable HLA test results as affirmative evidence of paternity.

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[215]Krause, *supra* note 5, at 281.

[216]Tribe, *supra* note 94, at 1338.