

The meeting was called to order at 8:10 a.m. Senator Close was in the Chair.

PRESENT: Senator Close
Senator Hernstadt
Senator Don Ashworth
Senator Dodge
Senator Ford
Senator Raggio
Senator Sloan

ABSENT: None

SB 294 Provides for establishing parentage and enforcing support of children.

See minutes of March 14 for previous testimony and discussion.

Testifying on this bill were Ace Martell, Deputy Administrator, Welfare Dept., Walt Lloyd, Deputy Attorney General assigned to the Welfare Department in Child Support Enforcement, and Bill Furlong with Support Enforcement.

Mr. Martell stated that he had two articles he would like to pass out in regard to the blood tests. The first article is on the HLA testing for paternity (see attachment A). The second article is the guidelines for the American Medical Association and American Bar Association (see attachment B). He stated he thought perhaps this would help with the questions the Committee had on the validity of blood tests as they are today.

Senator Close stated that the Committee would look them over and they would now proceed with going through the bill from where they had left off at the last meeting.

Mr. Martell stated that section 10 is identical to the Uniform Parentage Act, except reference to our district courts has been incorporated into this bill.

Senator Close asked how many states had already adopted the Uniform Parentage Act.

Mr. Furlong stated he had a list, which he passed out to the Committee (see attachment C).

Mr. Martell stated that he believed that in addition to Oklahoma there were three other states considering this type of Legislation.

Mr. Lloyd stated that Section 11 deals with the identities of the parties. The most significant thing in this section is that the child has a recognized independent interest. This came about because the parents quite commonly engage in

bargaining between themselves, and it is not in the best interest of the child. The interest of the child would then be secured by either a guardian or a guardian ad litem.

Senator Ford stated she would like to see a declaration of intent, on this point, spelled out somewhere in this Legislation.

Section 12 - Senator Raggio asked if California didn't omit this section.

Mr. Lloyd stated that California uses Masters. They use the pre-trial conference as opposed to a hearing. He also stated that this section deals with use immunity rather than transactional immunity.

Mr. Lloyd stated that Section 13 relates specifically to the blood test utilization. He stated that this is the section that relates to the articles he passed out, as this gives both the medical and legal point of view on blood tests.

Senator Raggio stated that on line 32 where it states "the tests are receivable in evidence", this language should be struck or the "are" changed to "may be." The way it stands he feels it could be made mandatory.

Mr. Martell stated that the language here is stronger than the Uniform Parentage Act, but it makes it right on point. However, it is still the discretion of the courts.

Section 14 - The Committee after some discussion felt that there was some question as to what tests would be required.

Mr. Furlong stated that their department would have no objection to removing everything after the first section in Section 4 if that would alleviate the problem.

Mr. Martell stated he felt this language should come out.

Mr. Lloyd stated that Section 15 were the pre-trial recommendations.

Mr. Lloyd stated that Section 16 is where we are identifying this as a civil action. This section provides that there could be a jury trial at the request of one of the parties. This is not part of the Uniform Parentage Act.

Senator Ashworth stated that he could see a real problem with this as it could be used as a blackmail tool by an individual that knows the other side doesn't want any publicity.

Mr. Lloyd stated that Section 17 deals with deals with judgments and structured settlements. Section 18 deals with costs.

Senator Ashworth asked why the language in Section 19 states

that payment may be made through the clerk of the court.

Mr. Lloyd stated that this tracks with the uniform act and is in the law now.

Mr. Lloyd stated that Section 20 deals with the show of cause order by the court. Section 21 is the pre-trial hearing. Section 22 preserves confidentiality in closing and sealing the records.

Senator Dodge asked if Section 22 wouldn't negate the confidentiality if there were a jury trial.

Mr. Lloyd stated that the findings of the court are public. Once there is a trial there is going to be an order and that is public record, however, the facts leading to that order are not. The court has had for many years a provision of sealing of the documents.

Senator Close asked why everything is sealed but the final judgement.

Mr. Lloyd stated that is because it merely states that so and so is the father and has an obligation to support. The particulars are contained in a letter opinion of the court dated so and so.

No comments were made on Sections 23 thru 25.

Mr. Lloyd stated that Section 26 came about because in amending chapter 126 we were really impacting chapter 128, as to procedure for the termination for parental rights upon anticipation of an adoption proceeding. We took this and reworked it with Mr. Daykin, amending 128 where all of these procedures are presently collected in our laws. This would lay the foundation for a case where a father walked in 5 years later and said "I want my child", he could not get the child because of the notification and because of abandonment.

After some discussion on some changes in the language (see attachment D), the Committee decided to go on later with the bill as they were scheduled to hear other bills.

Jack Homeyer with the Division of Vital Statistics stated he would like to submit some questions on this bill for the Committee to review (see attachment E).

AB 229 Removes distinctions based on sex from NRS 156.040.

AB 244 Removes distinctions based on sex from NRS 41.200.

AB 245 Removes distinctions based on sex from NRS 146.010 and 146.030.

AB 259 Extends annuity provision in partnerships to both widow and widowers.

AB 267 Provides additional penalty for certain crimes against blind and aged persons.

AB 246 Removes distinction based on sex from NRS 194.010.

Esther Nicholson, Representative of the League of Women Voters of Nevada, stated she was here to state that the League is in favor of all the above bills. She stated that these 5 are part of a package introduced by Karen Hayes and that she will also be here to testify on the other bills as they come over from the Assembly. These 5 bills will make another dent in equality for women and would be a step forward in removing all language and intent in the Nevada Statutes which make discrimination on the basis of sex.

Ruth Ann Wright, Chairperson for the Legislative Committee for Northern Nevada chapter of the National Organization of Women, stated they are also in support of the entire package and these 5 bills.

AB 229 Removes distinctions based on sex from NRS 156.040.

Senator Ford moved to report AB 229 out of Committee with a "do pass" to be placed on the consent calendar.

Seconded by Senator Hernstadt.

Motion carried unanimously.

AB 244 Removes distinctions based on sex from NRS 41.200.

Senator Raggio moved to report AB 244 out of Committee with a "do pass" and be placed on the consent calendar.

Seconded by Senator Sloan.

Motion carried unanimously.

AB 245 Removes distinctions based on sex from NRS 146.010 and 146.030.

Senator Ford moved to report AB 245 out of Committee with a "do pass" and be placed on the consent calendar.

Seconded by Senator Raggio.

Motion carried unanimously.

AB 246 Removes distinction based on sex from NRS. 194.010.

Senator Ford moved to report AB 246 out of Committee with a "do pass" and be placed on the consent calendar.

Senator Hernstadt seconded.

Motion carried unanimously.

AB 259. Extends annuity provision in partnerships to both widow and widowers.

Senator Ford moved to report AB 259 out of Committee with a "do pass" and be placed on the consent calender.

Senator Hernstadt seconded.

Motion carried unanimously.

AB 267 Provides additional penalty for certain crimes against blind and aged persons.

Senator Ford moved to report AB 267 out of Committee with a "do pass" and be placed on the consent calender.


Senator Raggio seconded.

Motion carried unanimously.

Senator Close stated he had a BDR from Senator Wilson for Committee introduction. BDR 12-1410 is "To provide procedure for obtaining a court order directing the transfer of stocks and bonds included in certain small estates." The Committee agreed unanimously for Committee introduction.

There being no further business, the meeting was adjourned.

Respectfully submitted


Virginia C. Letts, Secretary

APPROVED:

Senator Melvin D. Close, Jr., Chairman

come, habits and other factors; while the result might produce a longer life expectancy for women, explicit discrimination would be avoided, and individual differences among women would be accommodated.

Possibly, however, there may be an independent relation between sex or race and longevity. Forbidding sex-based (and race-based) tables would lead to a "subsidy" for men and minorities in life insurance programs and a larger "subsidy" for women and some racial groups in retirement programs. However, the subsidy as to any individual is unclear. Since the known research on the question of longevity is inadequate¹⁷ to reach any conclusion, Congress should sponsor the necessary research before acting.

Once the research were completed, Congress could make a reasoned judgment about the fairness of taking factors such as sex or race into account for these purposes. If there were a sizable and independent relation between longevity and sex or race, these factors could be taken into account in calculating fringe benefits. An amendment to Title VII would be necessary, either to mandate sex-based calculations, or make them optional. If they were made optional, Congress should also require consistent treatment of sex for life insurance and retirement purposes to avoid a practice that clearly disadvantages women.

¹⁷ The differences in mortality between sexes is partly due to a higher incidence of heart disease among men, but the life style and mortality of Americans in this and other areas is changing. There is, for example, an unexplained, recent decline in male mortality. See Dorothy Rice, Director of the National Center for Health Statistics, Statement Before the Senate Health Subcommittee, Health and Scientific Research Committee on Human Resources, U.S. Senate, Mar. 31, 1977, at 2.

THE LEGAL IMPLICATIONS OF HLA TESTING FOR PATERNITY*

Thirty years ago, it appeared that the courts were content to designate a "social father" for the illegitimate child in a paternity action. Such an approach was consistent with the idea that it is the *public* that benefits from the action, since a finding of paternity imposes a support obligation on the father and prevents the child from becoming a burden to taxpayers.¹ Juries were permitted to find men to be fathers despite medical evidence to the contrary,² because the courts proceeded from the premise that "parentage is not exclusively a subject for expert evidence."³

Considering the interests at stake and the costs of an erroneous decision—to the parties, to society, to the integrity of the legal system—the question of paternity should be dealt with empirically, as a question of genetics. Additionally, there is a growing trend to view the ascertainment of the natural father as a right of the child. As one authority has written,

[t]he paternity action must become respectable, if the promise of equal protection for the child is to be fulfilled. It will become respectable only if the man falsely named as the father is accorded the fullest possible protection. This goes primarily to the question of evidence, in particular, to the use of scientific evidence.⁴

Scientists have not to date found the ultimate paternity test, but by comparing blood samples from the alleged father with samples from the mother and child, they can draw meaningful conclusions. Because certain properties of the

* This brief presentation is intended as an introduction to Terasaki, *Resolution by HLA Testing of 1000 Paternity Cases Not Excluded by ABO Testing*, 16 J. FAM. L. 543 (1977-78) (this issue).

¹ H. D. KRAUSE, *ILLEGITIMACY: LAW AND SOCIAL POLICY* 105 (1971) [hereinafter cited as KRAUSE].

² *Berry v. Chaplin*, 74 Cal. App. 2d 652, 169 P.2d 442 (1946).

³ *Arnis v. Kalousnikoff*, 10 Cal. 2d 426, 74 P.2d 1043, 1047 (1947).

⁴ KRAUSE, *supra* note 1, at 108.

blood components are inheritable, detectable and varied, they perform as genetic markers and comprise the "most useful tool in solving parentage problems."³ For example, blood tests can exclude with certainty a falsely accused man in situations when his blood lacks a marker which the child has, and must have received from his natural father, or when his blood contains a marker that would have shown up in the child's blood if the accused man had been the father, given the mother's genetic make-up.⁴

In the courts, test results have traditionally been admissible only for the purpose of showing non-paternity. The defendant usually offers the test results to exclude himself. In some circumstances, however, the plaintiff may introduce the evidence; if the defendant names other men as potential fathers, the plaintiff-mother may be permitted to rebut with blood test results excluding them.⁵

Some legislation would give greater weight to the results of blood tests than have the courts. Section 4 of the Uniform Act on Blood Tests to Determine Paternity⁶ makes test results conclusive on non-paternity, and opens the door for the affirmative use of blood test evidence to show paternity. The last sentence of Section 4 provides:

³ See *Current Status of Paternity Testing*, 9 FAM. L. Q. 615, 616 (1975) [hereinafter cited as Lee]. Principles of genetics and blood chemistry which form the bases for the tests are clearly and fully explained in this article.

⁴ For a thorough explanation of the methods of excluding individuals on the basis of laws of heredity, see Larson, *Blood Test Exclusion Procedures in Paternity Litigation: The Uniform Acts and Beyond*, 13 J. FAM. L. 713 (1973-74).

⁵ *Huntington v. Crowley*, 45 Cal. Rptr. 469 (1965), *rev'd on other grounds*, 64 Cal. 2d 617, 414 P.2d 382, 51 Cal. Rptr. 251 (1966). In this case, the trial court had refused to admit the plaintiff's medical evidence which would have excluded two men named by the defendant as likely to be the father. On appeal, the ruling was held to be reversible error. The supreme court reversed, but on the ground of lack of widespread acceptance of the tests used, leaving intact the admissibility of blood test evidence to rebut the defense. In other words, in some jurisdictions the defense that the mother had had sexual relations with other men at the approximate time of conception is not conclusive. For further explanation of the defense, see Knaust, *supra* note 1, at 121-22.

⁶ UNIFORM ACT ON BLOOD TESTS TO DETERMINE PATERNITY § 4, 9 U.L.A. (Supp. 1971-76) 382. This legislation, drafted in response to the unscientific decisions in *Chaplin and Kalensouloff*, *supra* notes 2 & 3, sets out procedures for ordering the tests, selecting experts, and giving effect to the test results.

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.⁷

A minority of states has adopted either the Uniform Act on Blood Tests to Determine Paternity or the Uniform Act on Paternity. It should be noted that the above-quoted provision has not been unanimously enacted in the adopting states.⁸ A third act, the Uniform Parentage Act,⁹ provides for more liberal admissibility:

Evidence relating to paternity may include:

(3) blood test results, weighted in accordance with evidence, if available, of the statistical probability of the alleged father's paternity.¹⁰

Although the uniform acts encourage the use of blood test evidence, they do not discuss how the testing should be carried out. Recently, Joint AMA-ABA Guidelines¹¹ recommended that testing proceed in stages, with the more general tests (ABO, Rh, MNSs systems) first. If no exclusion is produced at the first round, more screenings can then be performed (Kell, Duffy and Kidd systems). It is estimated that the probability of excluding a man who is not the father ranges from 63 to 72 percent (depending on race) when the six systems are screened.¹² The AMA-ABA Guidelines rec-

⁷ *Id.*

⁸ The UNIFORM ACT ON BLOOD TESTS TO DETERMINE PATERNITY was adopted in states (California, New Hampshire, Oregon, Pennsylvania and Utah). California and Pennsylvania omitted the last sentence of § 4, which would allow introduction of evidence of possibility of paternity within narrow limits. See HARRIS, SOME OBSERVATIONS ON THE UNIFORM ACT ON BLOOD TESTS TO DETERMINE PATERNITY, 9 CAL. L. REV. 59 (1963). In the UNIFORM ACT ON PATERNITY, 9 U.L.A., drafted in 1970, there are parallel provisions to §§ 1-4 found at §§ 7-10. The entire act was adopted in Kentucky, Maine, Utah, Montana and New Hampshire; the last two sentences have been left out in the version adopted in Mississippi.

⁹ UNIFORM PARENTAGE ACT, 9 U.L.A. (Supp. 1976), has been adopted by California, Hawaii, Montana, North Dakota and Washington.

¹⁰ *Id.* § 12.

¹¹ Abbott, *Joint AMA-ABA Guidelines: Present Status of Serologic Testing in Cases of Disputed Parentage*, 10 FAM. L. Q. 247 (1970) [hereinafter referred to as the AMA-ABA Guidelines].

¹² *Id.* at 256.

commend: "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 90 per cent level."¹⁵

When a putative father has still not been excluded at an advanced stage of testing, the likelihood that he is the father can be computed. The estimate is based on the frequencies of genetic markers in the general population: the investigator takes the frequency of the putative father's genetic constellation among real fathers for that mother/child combination, and compares it to that of the random man (frequencies in the general population).¹⁶ This procedure is currently practiced by national blood labs in Oslo, Stockholm and Copenhagen, where results are reported to the court only if the probability is significantly high (above 95%) or low (less than 5%).¹⁷

Although statistics for probability of paternity are mentioned in the Uniform Act on Parentage, and arguably are admissible in the court's discretion under the Uniform Act on Blood Tests to Determine Paternity, the AMA-ABA Guidelines have recommended that the evidence be more readily admitted under the statutes:

It is recommended 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."¹⁸

While statistical evidence of probability of paternity may be challenged as not relevant to prove the disputed fact, it has been argued that the most common errors in the use of probability statistics "either do not arise in the use of scientific evidence to prove paternity or are corrected by the

¹⁵ *Id.*

¹⁶ For more detailed explanations of the calculations, see Lee, *supra* note 5, at 610-13 and the AMA-ABA Guidelines, *supra* note 13, at 260-63.

¹⁷ Krause, *The Uniform Parentage Act*, 8 FAM. L. Q. 1, 10-11 (1974).

¹⁸ *The AMA-ABA Guidelines*, *supra* note 13, at 263.

other evidence in the case."¹⁹ An appropriate safeguard would be to restrict the use of the evidence to corroboration of independent evidence, such as testimony that the defendant had had sexual relations with the mother at the critical time.

Expanded use of HLA testing has been recommended by the AMA-ABA Guidelines.²⁰ The following article presents the results of the first large-scale study of disputed paternity cases to make use of HLA testing for both exclusion and for estimating probability of paternity. The author explains the principles of the test and points out the features which make it especially suitable for solving paternity problems. His results indicate that HLA testing may be the means for making the paternity action respectable.²¹

MARY F. FORREST

¹⁹ *The Use of Blood Tests to Prove Paternity in California*, 3 U.S.F.L. Rev. 297, 307 (1969). This article presents well-reasoned arguments for the use of blood test evidence to show paternity; it provides a comprehensive analysis of leading cases on admissibility of scientific and statistical evidence, and discusses potential objections to such evidence.

²⁰ *The AMA-ABA Guidelines*, *supra* note 13, at 281.

²¹ The procedure followed by Dr. Terasaki involved the use of HLA testing directly after the ABO testing, which had not produced an exclusion. This is not the full procedure endorsed in the *AMA-ABA Guidelines*. In Dr. Terasaki's test, five intermediate exclusion tests were omitted. However, Dr. Terasaki indicates that the small increase in cumulative probability of exclusion of non-fathers which would result from the testing of all seven systems did not justify the cost of the tests in his study. The HLA system alone yields a 78-80% probability of exclusion, while the individual probabilities of the omitted systems are significantly lower. The reader is referred to the *AMA-ABA Guidelines*, *supra* note 13, at 247-58 for the relevant data and formulae.

RESOLUTION BY HLA TESTING OF 1000 PATERNITY CASES NOT EXCLUDED BY ABO TESTING

by Paul I. Terasaki*

I. INTRODUCTION

A revolution in paternity testing is currently underway with the introduction of HLA testing. The HLA system of tissue types is so powerful in determining the probability of paternity that many of the older rules of evidence for blood tests in disputed paternity cases now require complete revision.

Generally, it has been assumed by American courts that blood testing is only valid for exclusion of paternity. This conclusion is based on the fact that when the putative father is not excluded by ABO testing, his chances of actually being the father are not usually high. Thus, for purposes of blood test evidence, any random male could have been the father almost as easily as the nonexcluded putative father. With HLA testing, the probability of a nonexcluded male being the actual father is usually over 90%.

This high degree of discrimination in either excluding or including, with a high probability, a given male is a result of the extreme diversity of HLA types in the population.

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The author wishes to acknowledge the critical aid in performing this work and gathering the data received from Dr. Domenico Hernoco, Dr. M.R. Mickey, Mr. David Gjertson, Ms. Judy Bond, and Mrs. Sandra Perdue.

For the legal implications of HLA testing for paternity, see introductory material 16 J. FAM. L. 537 (1977-78) (in this issue).

Most people are "rare" types because only about one out of a thousand people will have a similar HLA type. Consequently, this relatively rare type can be looked for in the child of any given mating. If the child has the same rare type as the putative father, the man is likely to be the actual biological father. 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.

Numerous recent reports have summarized the advancement of paternity testing since HLA testing has become possible. For example, the joint AMA-ABA guidelines for serologic testing in paternity cases¹ clearly states that the HLA test is by far the most powerful single paternity test for exclusion. Theoretical calculations which support this statement have been provided by European authorities.² The HLA system has now been used in Europe for five years,³ and to a more limited extent in the United States.⁴ The basic statistical formulas used in calculating the probability of paternity are predicated on Bayes' Theorem⁵ as applied by Essen-Möller.⁶

In this report, we present data on the largest series of cases to date in which HLA typing was performed. Essentially all of these cases were referred to us because the ABO red cell tests were inconclusive. The remarkable power of the

¹ Abbott, *Joint AMA-ABA Guidelines: Present Status of Serologic Testing*, 10 *FAM. L. Q.* 247 (1976).

² Speiser, *Chances of Paternity Exclusion in Tabular Form*, 143 *Z. IMMUNITÄTSFORSCH* 203 (1972); Mayr, *The HLA System in Paternity Testing - Das HLA-System in der Paternitätsserologie*, 75 *Z. RECHTSMED.* 81 (1973).

³ See Jeannot, Nassig & Berthelm, *Use of the HLA-A Antigen System in Disputed Paternity Cases*, 21 *VUX SANG.* 197, 197-200 (1972); Spielmann & Seidl, *The Application of the HLA-A System in Cases of Disputed Paternity—Zur Anwendung des HLA-A Systems in der Paternitätsserologie*, 74 *Z. RECHTSMED.* 121 (1974).

⁴ Schacter, Hsu & Wias, *HLA and Other Genetic Markers in Disputed Paternity: A Report of 50 Cases*, 9 *TRANSPLANT. PROC.* 233 (1977).

⁵ Beutlyman, *Paternity Actions - A Matter of Opinion or a Trial of the Blood*, 17 *J. LEGAL MED.* (1976); Salmon & Gremy, *Bayesian Process for Paternity Diagnosis*, 7 *GRUPE DE RECHERCHE EN INFORMATIQUE MEDICALE*, 291, 291-98 (1973).

⁶ Essen-Möller, *Beweiskraft der Ähnlichkeit im Partnerschaftsachweis; Theoretische Grundlagen*, 68 *MITT ANTHROP GES (WEIN)* 368 (1938).

HLA test to resolve these cases based on theoretic calculations can be fully substantiated in actual practice. The 1000 consecutive cases reported here are from February 1975, and no case has been omitted. The racial composition of the putative fathers was as follows: 59% Caucasians, 22% Mexican-Americans, 17% Negroes, and 1% others.

II. BASIC PRINCIPLES—GENETICS OF HLA

The HLA region is also called the major histocompatibility complex in man. The term refers to a genetic region on the chromosome that plays a dominant role in the survival of grafted tissue. The letter H stands for human, L for leukocyte (white blood cells), and A for antigen. An *antigen* is any substance which can stimulate antibody production when introduced into another individual. Antigens are produced under genetic control by genes. The position of a gene on the chromosome is called a *locus* (plural: loci). In this study, two loci of the HLA region, the A and B loci, were used to evaluate paternity. At each locus a person possesses two genetic expressions for antigens, or two *alleles*. An allele represents an alternative form of a gene occupying the same locus on paired chromosomes. Any test that detects antigens by using antisera (antibodies) is called a *serologic* test.

The summary of the identifiable antigens at the cell surface is the person's *phenotype*. The genetic basis for the phenotype is deduced from inheritance patterns among the offspring of a family, and is called the *genotype*. The *haplotype* is the combination of one A locus allele and one B locus allele occurring on the same chromosome, which is transmitted between generations as a packet. Two haplotypes, one from each parent, make up the genotype of the individual. The maximum number of HLA antigens that can be expressed on the cell, when only the A and B loci are considered, is four. The presence of two different antigens at a given locus automatically excludes the presence of all other alternative specificities or alleles and eliminates the possibility of a missing allele due to technical error. If the number of antigens is less than four, two possible explanations exist. First, the individual may be homozygous at a given locus;

as follows: B5, B7, B9, B12, B13, B14, B15, BW38, BW39, B17, B18, BW21, BW22, B27, BW35, B37, and B40. A total of 180 independent antisera was used to determine the HLA profile of each individual. The tests were performed independently by two technicians and then evaluated by at least two experts in HLA analysis. As a further quality control, two separate preparations were made and analyzed from each blood sample.

B. Reliability of Tests

Although HLA testing was conceded by one authority to be the most discriminating test for paternity analysis, he has stated that HLA typing is reputed to have a high error rate and is consequently subject to misclassifications.⁹ However, this criticism has been inaccurate since 1970 when extensive data on reproducibility of the microcytotoxicity test were published by this laboratory.¹⁰ A more recent study of the technical improvements and attendant improvement in error rates has also been published by us.¹¹ The overall reaction error rate of 1.08% in 1971 was reduced to 0.35% by 1976. This rate was computed using 202,860 reactions in 882 pairs of replicate typing tests. It is important to note that even this low serologic error rate is too high an estimation of the rate of misclassification of antigens, since assignments of HLA specificities are made using more than one antiserum to define each HLA group. Thus, HLA typing can be considered highly reliable when performed under carefully controlled conditions by laboratories that perform quality control checks such as those herein described.

C. Statistical Considerations

In cases when paternity of the putative father is not excluded, it is useful to have some measure, based on serol-

⁹ Wiener & Socha, *Methods Available for Solving Medicolegal Problems of Disputed Parentage*, 21 J. FOR. SCI., 42, 42-64 (1976).

¹⁰ Terasaki & Mickey, *Histocompatibility-Transplant Correlation, Reproducibility, and New Matching Methods*, 3 TRANSPLANT. PROC. 1057, 1057-1071 (1971).

¹¹ Perdue, Terasaki, Honig & Estrin, *Reduction of Error Rates in the Microcytotoxicity Test*, 9 TISSUE ANTIGENS, 259, 259-266 (1977).

ogical testing, of the likelihood that he is the actual father of the child in question. In essence the child has provided an objective genetic description of its father. This premise poses two questions: how closely does the putative father fit that description and how discriminating is the description.

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 can be calculated. Probabilities are assigned to the various possible genotypes using population statistics and then all possible combinations are considered in the calculation.¹² If a group of putative fathers was being considered, a computation of the probability of paternity for any among the group would be possible by direct application of Bayes' Theorem.¹³

Ordinarily, a comparison of the nonexcluded putative father with a hypothetical man who is assumed to be random with respect to serologic genotypes and unrelated to the putative father in question is desired. The probability that a mating of the known mother with a randomly chosen man would produce a child with the genetic markers in question can also be from the frequency of the markers in the general population. The *probability of paternity* for the putative father is then the ratio of his probability to the sum of the probabilities for both men, an application of the Essen-Möller version of Bayes' Theorem.¹⁴ 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.

D. Exclusion

The simplest type of exclusion is shown by case #4, illus-

¹² See note 6 *supra*.

¹³ Salmon & Gremy, *Bayesian Process for Paternity Diagnosis*, 7 GROUPE DE RECHERCHE EN INFORMATIQUE MEDICALE, 291-98 (1973).

¹⁴ See note 6 *supra*.

trated in Table 1 (page 556 *infra*). The mother's phenotype was A2, AW24, BW35. The child's phenotype was A2, AW30, B15 and BW35. By examining the mother and child for the common haplotype, it can be seen that the child has inherited the A2-BW35 haplotype from the mother. That is, these are the A- and the B-loci antigens that are in common between the mother and the child. From this first step we can see that the child must have inherited the other haplotype AW30-B15 from the father. The putative father in this particular case had the phenotype A2, B5, B12. This means that he could not be the father of this child since he did not have the AW30-B15 haplotype. This would be the clearest and simplest type of exclusion. Likewise, cases #197 and #216 (Table 1) are also simple cases of exclusion of paternity.

Another type of exclusion that is slightly more complicated is an instance in which the child could have inherited the antigens from the mother in two or more different possible genetic combinations. As demonstrated by case #6 (Table 1), the child could have inherited either the A2-B5 or the A1-B5 haplotype from the mother. Either of these two combinations could have been inherited since the child and the mother share three antigens. This means that the father could have been either A1-BW35 or A2-BW35 depending on which maternal haplotype had been inherited. In this instance, the putative father's phenotype was A2, B12 which does not fit either of the child's possible paternal haplotypes, thus excluding this putative father. In case #24, the blank (X) possibility in the A locus of the child causes the paternal haplotype to be either of two types: A2-BW21 or X-BW21. Again, the putative father did not have either of these two haplotypes and could be readily excluded. Case #102 is interesting in that the mother was deceased and could not be typed. However, the putative father in that case could still be excluded. There were four possible haplotypes that the true father could have had and none of these were found in the putative father. Exclusion, therefore, is possible in certain instances even if the mother cannot be typed.¹³

¹³ Moreover, paternity has been excluded without testing a deceased man by

E. Nonexclusion

In case #206 (Table 2, page 557 *infra*) the putative father was found to have the paternal haplotype required on the basis of subtracting the maternal haplotype from the child's phenotype; that is, since the child inherited A1-B7 from the mother, the paternal haplotype must be A11-B27. This particular putative father has both the A11 and B27 antigens. By comparison with the random population of Caucasians, the probability of paternity for this putative father is calculated to be 99.2%. The probability of paternity is high because the A11-B27 haplotype is so rare that a randomly chosen male would be very unlikely to transmit it. If a particular putative father shares that rare haplotype with the child, the chances of him being the actual father are high.

In about a quarter of the nonexcluded cases, two possible paternal haplotypes for the child can be inferred. In case #10 (Table 2), the child could have two possible maternal haplotypes, AW33-B14 or AW32-B14. This means that the child could have had two different paternal haplotypes, AW32-B5 or AW33-B5. The putative father had AW32-B5, giving him a probability of paternity of 99.3%. Although two possible paternal haplotypes exist, the probability of paternity is still high due to the rarity of the haplotypes. Moreover, where the father's haplotype could be several different combinations and still fit the child's paternal haplotype, the probability of paternity can remain high (case #26, Table 2).

When the mother and child share as many as all four antigens (case #104, Table 2), it then becomes possible for the father to have four different haplotypes. The putative father had A29 and B12 antigens that fit one of the child's possible paternal haplotypes. The Bayes' Theorem calculations are particularly helpful in these instances in which several possible haplotype constructions exist. The percent probability is reduced in certain instances (case #235, Table

testing his relatives. See Speiser, *Exclusion of Paternity in the HLA System Without Testing the Deceased Accused Man*, 27 VAX SASC. 379, 379-81 (1974)

603
EXHIBIT A

2) because the antigens involved are relatively frequent antigens.

F. Summary of 1000 Cases

The results of 1000 disputed paternity cases tested by HLA are summarized in Figure 2 (page 553 *infra*) plotted by probabilities of paternity. Twenty-five percent of the cases were certain exclusions. Of the remaining nonexclusion cases, 67% had a probability of paternity of more than 95% and 86% were greater than 90% probability of paternity. As many as 16% of the cases tested had probabilities greater than 99% as shown in the far right column. Thus, when a given putative father is not excluded, the unique feature of HLA testing is that such nonexcluded males can be assigned a high probability of paternity. These high values would be almost impossible to obtain by conventional testing as well as by testing for a large series of the currently known genetic markers.

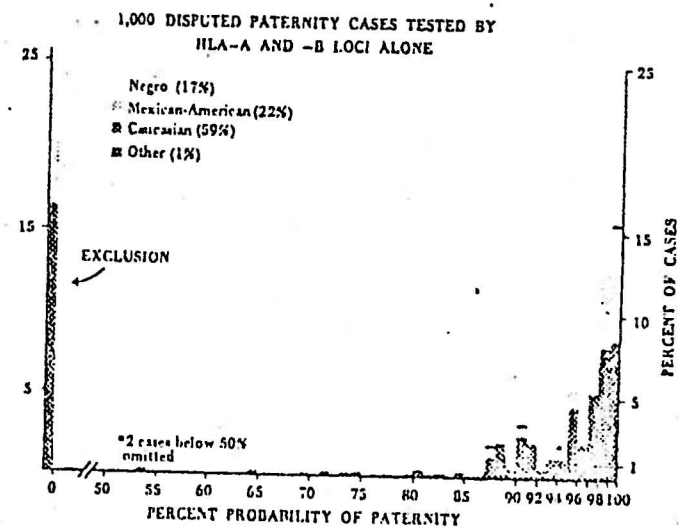
It should be noted that while minor variations can be seen among the three racial populations tested, remarkably similar results are obtained. In other words, the exclusion rates are for the most part similar and high probabilities of paternity are found in similar proportions. However, in making the probability calculations, differences in population haplotype frequencies for the three racial groups must be considered since the background frequencies are distinct within these populations.

Therefore, on the basis of these tests, 25% of the 1000 putative fathers were not the true fathers, 64% were the fathers (with 90% or greater probability), and 10% could be considered to be not resolvable by the HLA-A and -B loci tests.

IV. CONSIDERATIONS FOR THE FUTURE

The ideal paternity test would separate the putative fathers into two categories: exclusion and inclusion with 100% probability. The characteristic of this test would be the

Figure 2



Of the 1000 disputed cases of paternity, 25% of the putative fathers were excluded, as given in the left hand column. The remaining nonexcluded putative fathers generally had a high percentage of probability of being the actual father according to HLA testing. As many as 16% had a 99-100% chance as shown in the far right column, and 15% had a 98-99% probability of paternity. The results can be seen to be generally similar in the three ethnic groups tested.

use of determinants that are under strict genetic control, are easy to detect, and are so rare that no other random individual could possess them. The expression of these determinants must be codominant, in the sense that a given determinant present in a child must be expressed in one of the parents. The determinants must be fully expressed at birth,

remain unchanged throughout life, and be unaffected by any environmental effects. The HLA system at the present is the only blood test that approaches fulfilling all of these requirements. The HLA system is extremely polymorphic (diverse in numbers of antigens), reaches full expression long before birth, has been detected even in mummies,¹⁶ and, as far as it is known, is unaltered by environmental effects, such as massive blood transfusions, drugs, and onset of disease. Furthermore, the detection techniques for HLA are readily performed and reliable. As shown in Figure 2, (page 553 *supra*) simply by HLA testing for the A- and B-loci antigens, a result which approaches the ideal can be obtained.

Attempts are now underway in our laboratory to test selectively only those cases with low percent probabilities for other genetic markers. In this way, by the summation of probabilities, it should be possible to achieve either exclusion or greater than 90% probability of paternity in most cases. With use of further loci of HLA such as the C and D loci, even higher values can be expected in the near future.

Theoretically it is possible to exclude all nonfathers by utilizing some 62 known genetic systems, and conversely the actual father could be detected with virtual certainty. However, the enormous cost of performing all of these tests along with the rarity of some reagents makes their use for routine testing in disputed paternity cases completely unrealistic. It will thus be impractical to insist on 100% inclusion of paternity. However, in 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.

V. CONCLUSION

In practical terms, the ABO red cell test is the simplest and least expensive test for exclusion of paternity, and should be the one to be used initially. Since this test excludes

¹⁶ Stastny, *HLA Antigens in Mummified Pre-Columbian Tissues*, 183 SCIENCE 861 (1974).

less than 10% of the putative fathers, most of the cases would still be disputed. This article has shown that in 1,000 such cases of nonexclusion by ABO, 90% of the cases can be resolved to the extent that they are classified either as excluded (25% of the putative fathers) or nonexcluded, together with a relatively high percent probability of paternity (90%). By selectively adding other tests to the HLA testing, it would be possible to increase the percent probability of paternity and to exclude some fraction of the males who fall in the nonexclusion category. However, as this article demonstrates, the HLA test provides, by itself, a very powerful, effective new tool in cases of disputed paternity.

Joint AMA-ABA Guidelines: Present Status of Serologic Testing in Problems of Disputed Parentage*

American Medical Association, Committee on Transfusion and Transplantation, Drs. Jack P. Abbott and Kenneth W. Sell, Chairmen, and American Bar Association, Section on Family Law, Committee on Standards for the Judicial Use of Scientific Evidence in the Ascertainment of Paternity, Harry D. Krause, Chairman, (Principal draftsmen: J. B. Miale, M.D., E. R. Jennings, M.D., W. A. H. Rettberg, M.D., K. W. Sell, M.D., and H. D. Krause).

Preface

In 1971, the American Bar Association's Section on Family Law approached the American Medical Association requesting that a joint committee be formed to study the implications of scientific advances in blood typing tests to determine (non)paternity and make appropriate recommendations.

This report brings to successful conclusion five years of close collaboration between members of the medical and legal professions.

It represents the first "official" statement concerning the science and art of blood typing in cases of disputed paternity since the

*Approved by the American Medical Association and by the Section on Family Law, American Bar Association. (In accordance with their policy against taking positions concerning technical reports involving non-legal subject matter, the House of Delegates of the American Bar Association has not taken a position on this report.)

reports of the AMA's Committee on Medicolegal Problems in 1952 and 1957 (Ref. 1, 2). It also is the first such report that was developed jointly by individuals working with both professional associations. With the endorsement of the AMA and ABA, the report is intended to provide guidance to the legislator, the judge and the practicing lawyer as well as to medical personnel engaged in this specialty. The purpose throughout has been to provide an understandable, though not oversimplified, definition of the current state of capabilities. The report will provide a measure of certainty where rapid recent scientific developments have created uncertainty as to what has become scientific fact and what remains hypothesis, and as to what is practically possible and what remains performable only under highly specialized conditions.

While the report identifies certain systems as useful for routine testing, there is no intent to exclude anything that can be shown to produce useful results. Indeed, even while this report was being discussed, new developments, especially in the HLA sector, began to overshadow more traditional approaches, and further progress may be anticipated. On the legal side, it is expected that this report will lead to further work and specific legislative proposals, particularly regarding the law of evidence. In short, this report is intended as the beginning of a continuing process.

Many have helped bring us to this stage. Special thanks are due to John B. Miale, M.D., the principal draftsman on the medical side, as well as to Drs. Elmer R. Jennings, William Dolan and William Rettberg, subcommittee members and Dr. Herbert F. Polesky. On the legal side, thanks are due to Judge Orman Ketcham, Harry Fain, Esq., and Lawrence H. Stotter, Esq., who provided valuable comments on the numerous drafts through which this report was put. A great many thanks also go to the members of the original AMA's ad hoc committee consisting of Drs. Alexander S. Wiener, Chang Ling Lee and John B. Miale who originally undertook to study the medical side and who, after two years of fruitful and enlightening discussion greatly enhanced the depth and scope of this report. Much gratitude, finally, is due to Dr. Joseph B. Jerome of the AMA staff whose help and dedication were crucial to the successful completion of this report.

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American Bar Association

EXHIBIT B

I. Introduction

A. *The Facts and Law of Illegitimacy*

Despite declining birth rates, the problem of illegitimacy remains at the level of a national crisis. The ten years from 1961 to 1970 saw enough new illegitimate children to populate a city the size of Los Angeles; the last five years, a city the size of Detroit. More than three hundred and ninety-eight thousand illegitimate children were added in 1970, 360,000 in 1969, 339,000 in 1968, 318,100 in 1967, 302,000 in 1966, for a total exceeding 1,700,000 in just these five years. Moreover, not only has there been an increase in the absolute number of illegitimate births, but the rate has been accelerating and now exceeds ten percent of all births. In many urban areas illegitimacy stands at forty percent and in some it exceeds fifty percent. Neither the "pill" nor liberalized abortion has fulfilled early expectations that the end of illegitimacy may be at hand. On the contrary, while births in general have fallen off, the growing acceptance of "new lifestyles" and the reduced social stigma of illegitimacy seem to have combined to produce the highest proportion of births out of wedlock on the American record. Law and legal practice need to be adapted to changing and unchanged social facts—changing in terms of the increasing acceptability of illegitimacy, but unchanged in terms of each child's right to and need of a legal relationship with his father.

In the eyes of the common law, the illegitimate child had no father at all. Although the mother and child relationship has long been equalized by law, most states have continued to discriminate heavily in the substantive relationship between father and illegitimate child. Discrimination extends to rights of support, inheritance, custody, name, and claims under father-related welfare statutes, such as workmen's compensation, wrongful death, and various federal acts. In short, our law has seen the illegitimate child as the child of his mother and traditionally has all but denied the existence of his father.

This tradition is coming to an end. Beginning in 1968, the United States Supreme Court decided a series of cases on the basis of the Equal Protection Clause of the Federal Constitution which establish the principle that the illegitimate child is entitled to legal equality with the legitimate child in most substantive areas of the law. Numerous state statutes discriminating against illegitimate children have been declared unconstitutional, and the bulk of the remaining legislation on this subject is under severe constitutional doubt.

In one of many decisions favoring the illegitimate child, the United States Supreme Court said:

The status of illegitimacy has expressed through the ages society's condemnation of irresponsible liaisons beyond the bonds of marriage. But visiting this condemnation on the head of an infant is illogical and unjust. Moreover, imposing disabilities on the illegitimate child is contrary to the basic concept of our system that legal burdens should bear some relationship to individual responsibility or wrongdoing. Obviously, no child is responsible for his birth and penalizing the illegitimate child is an ineffectual—as well as an unjust—way of deterring the parent. Courts are powerless to prevent the social opprobrium suffered by these hapless children, but the Equal Protection Clause does enable us to strike down discriminatory laws relating to status of birth where—as in this case—the classification is justified by no legitimate state interest, compelling or otherwise.

The fair conclusion to be drawn from these cases is that state and federal law may not discriminate between legitimate and illegitimate children in any significant substantive area other than inheritance.

Nevertheless, the gulf between the abstract principle and the realization of legal equality between legitimate and illegitimate children continues to loom wide. Owing largely to defective and antiquated paternity ascertainment procedures, only a very small fraction of illegitimate children now achieve legal relationships with

their fathers. All gains in substantive rights will mean little or nothing if our procedures for ascertaining paternity are not improved.

Enacted in 1975, Pub. L. 93-647 has injected federal funds and interest into this area. Each state is required to develop an appropriate plan, in accordance with HEW standards, for the ascertainment of paternity (and child support enforcement) within the framework of the A.F.D.C. program. The applicability of the federal legislation, however, is *not* limited to the welfare area and extends to all disputed paternity cases.

Given the substantive legal equality mandated by the United States Supreme Court and Pub. L. 93-647, fundamental reform of the paternity action has become the most pressing task in the area of illegitimacy. Reform is needed to provide a responsible parent for the illegitimate child as well as to protect men who are falsely convicted in what some states anachronistically continue to view as a criminal prosecution. (The cost of even relatively extensive blood typing procedures is dwarfed by the potential cost of child support for eighteen years or more).

Reform must come on two levels: We need a new procedural framework for the paternity action improving both quality and volume and, within that new framework, medical evidence must play the cardinal role. The new procedural framework has been created by the Uniform Parentage Act, adopted by the National Conference of Commissioners on Uniform State Laws in 1973 and approved by the American Bar Association in 1974. Providing an appropriate framework for the utilization of medical evidence is the function of this report.

B. This report has been prepared with the following goals:

1. To make available an authoritative guide to all parties who deal with the medicolegal problems of disputed parentage: physicians, attorneys, the courts, legislatures and federal and state health agencies. Accordingly, this report is concerned equally with medical and legal aspects.
2. To survey the total and potential role of serologic testing, as a guide to expanded application in the future.
3. To recommend the present-day application of a limited

EXHIBIT

number of serologic systems which are believed to be cost-efficient, reliable and noncontroversial.

4. To present data indicating probabilities of exclusion of paternity given various combinations of test systems.
5. To recommend expanded application of serologic data in the estimation of probability of paternity and to discuss and provide guidance concerning the determination of "likelihood of paternity," a concept in common use in Germany and the Scandinavian countries but so far little used in the United States.
6. To recommend the adoption of standard procedures with regard to identification of the involved parties, the collection and identification of specimens, and acceptable laboratory quality control.
7. To make recommendations to the AMA and ABA as to goals to be achieved in the future.
8. To recommend legislation clarifying and simplifying the admissibility in evidence of test results and the effect thereof, including the evidentiary value of the estimation of "likelihood of paternity."

II. Systems Potentially Applicable in Disputed Parentage

As many as 62 immunologic and biochemical systems are potentially applicable (Table 1 page 253). The application of all known systems would establish nonpaternity for about 98 percent of falsely accused men. However, such extensive testing is neither feasible nor recommended, for the following reasons:

1. Antisera for all serologic systems are either not available or in some cases individual antisera are available only in one or very few laboratories.
2. The probability of exclusion in some of the serologic systems is very low, because there are "high frequency" factors found in a large portion of the population.
3. Biochemical systems are being applied to disputed parentage problems in other countries and by some investigators in this country. Where available they can be used to supplement the blood group systems. The ones most useful are the protein

Table 1
Mean Probability of Exclusion of Non-Fathers for Potentially Useful Systems*

GENETIC MARKER OR SYSTEM	MEAN PROBABILITY OF EXCLUSION OF NON-FATHERS		
	BLACK	WHITE	JAPANESE
ABO	.1774	.1342	.1917
Auberger	.0105	.0186	...
Cartwright (Yt)	.0069	.0395	...
Colton	0	.0266	...
Cs	...	.0006	...
Diego	.0030	0	.0304
Dombrock	.0661	.0518	...
Duffy	.0420	.1844	.1159
Henshaw	.0151	0	...
Hunter	.0170	.0026	...
Kell	.0049	.0354	0
Kidd	.1545	.1869	.1573
Lewis ¹	.0262	.0024	.0193
Lutheran	.0368	.0311	0
MNSs	.3206	.3095	.2531
P	.0026	.0266	.0809
Penney	0	.0109	0
Rh	.1859	.2746	.2050
Sd	...	.0052	...

*From reference 3, modified and with additions. Probabilities of exclusion of non-fathers are calculated from gene frequencies from various authors quoted in the reference, and are considered representative.

¹Exclusion of paternity using Lewis cannot be made unless it is combined with secretor testing.

EXHIBIT B

Table 1 (Continued)

GENETIC MARKER OR SYSTEM	MEAN PROBABILITY OF EXCLUSION OF NON-FATHERS		
	BLACK	WHITE	JAPANESE
Secretor	.0305	.0296	.0238
St	...	.0006	.0283
Sutler	.0667	0	...
U	.0001	0	...
Vcl	0	.0184	0
Xg ¹	.1615	.0965	.1344
Acetylcholinesterase	...	.1153	...
Acid phosphatase	.1588	.2323	.1340
Adenosine deaminase	.0283	.0452	.0291
Adenylate kinase	.0059	.0428	0
Ag(x)	...	.0813	...
Alcohol dehydrogenase (locus 2)	...	.0452	...
Alcohol dehydrogenase (locus 3)	...	.1824	...
α -acid glycoprotein	.1834	.1773	.1583
α -antitrypsin	.0180	.0806	.0170
Amylase (urinary)	.0411	.0399	...
Ceruloplasmin	.0504	.0059	.0214
Complement, third component	.0819	.1523	.0192

These are sex-linked systems and are only useful in female children.

systems (Gm, haptoglobin, Gc, Km), the red cell enzymes (AcP, PGM, ADA, EsD), and hemoglobin (beta-chain variants in Blacks).

4. The recommendation made in Section III affords a potentially very high chance of exclusion utilizing only seven test systems at a reasonable cost, whereas the utilization of all known

Table 1 (Continued)

GENETIC MARKER OR SYSTEM	MEAN PROBABILITY OF EXCLUSION OF NON-FATHERS		
	BLACK	WHITE	JAPANESE
Diaphorase	...	.0085	...
Esterase D	...	.0913	...
Galactose-A-phosphate-uridylyl-transferase	....	.0626	...
Glucose-6-phosphate dehydrogenase ¹	.0932	0	0
Glutamic oxaloacetic transaminase (soluble)	0	0	.0113
Glutamic pyruvic transaminase (soluble)	.1285	.1875	.1826
Glutathione reductase	.2071	.2016	...
Gm. serum groups	.2071	.2275	.1873
Group-specific component	.0731	.1661	.1560
Haptoglobin	.1873	.1834	.1596
Hemoglobin β	.0453	0	0
HLA	.78-.80	.78-.80	.78-.80
Km. serum group (Inv)	.2366	.0601	.1664
Malic enzyme (NADP) soluble	.1258	.1681	...
Parotid basic protein	.1163	.0050	0

These are sex-linked systems and are only useful in female children.

systems would cost disproportionately more with only a slight increase in probability of exclusion. No definite statement of cost of quality testing is possible since this may vary regionally. All parties should note that this is an area of special com-

Table 1 (Continued)

GENETIC MARKER OR SYSTEM	MEAN PROBABILITY OF EXCLUSION OF NON-FATHERS		
	BLACK	WHITE	JAPANESE
Pepsinogen	.0126	.0126	0
Peptidase A	.0747	.1635	...
Peptidase C	.0665	.0102	...
Peptidase D	.0459	.0108	...
Phosphoglucosylase (locus 1)	.1344	.1457	.1476
Phosphoglucosylase (locus 3)	.1740	.1554	.1306
Properdin Factor B	...	.1443	...
Pseudocholinesterase (locus 1)	.0052	.0158	0
6-phosphogluconate dehydrogenase	.0335	.0229	.0586
Transferrin	.0410	.0064	.0079
Xm. serum group	.1757	.1625	...

petence and the assignment of testing should not be based on the lowest price available.

5. It is not the intent to recommend in all medicolegal problems of disputed parentage that the entire set of tests is mandatory. It is often possible to establish exclusion with the basic blood group systems (ABO, Rh, and MNSs). When these basic tests do not allow exclusion, extended testing may be done (using Kell, Duffy, and Kidd systems) to increase the mean probability of exclusion to the 63-72 percent level. In the event no exclusion is produced at that stage, additional testing using the HLA system (if necessary, by referral) may be done to raise the mean probability of exclusion to at least the 90 percent level. The discussion in this paragraph is in terms of the specific recommendations made in this report and is not intended to exclude the use of other systems (see III).

III. Systems Recommended for Current Use in Exclusion of Paternity or Parentage

Seven serologic systems are recommended for routine investigations (Table 2, page 257).

This recommendation is based on the following considerations: (1) antisera for the six blood group systems are available and reliable, (2) each system provides a reasonably high probability of exclusion in relation to cost, (3) the six blood group systems provide a cumulative probability of exclusion of 63-72 percent, depending on race, (4) the addition of only one other system (HLA) increases the probability of exclusion to 91-93 percent as compared with a probability of exclusion of about 98 percent for 62 systems.

This recommendation is not intended to exclude the use of additional systems (i.e., haptoglobins, hemoglobin variants, etc.) when an investigator has special expertise in these systems. (See II, 3, page 252).

Table 2
The Seven Test Systems Recommended

SYSTEM	MEAN PROBABILITY OF EXCLUSION OF NON-FATHERS		
	Black	White	Japanese
1. ABO	.1774	.1342	.1917
2. Rh	.1859	.2746	.2050
3. MNSs	.3206	.3095	.2531
4. Kell	.0049	.0354	0
5. Duffy	.0420	.1844	.1159
6. Kidd	.1545	.1869	.1573
7. HLA	.78-.80	.78-.80	.78-.80

Table 2 gives the individual probabilities for each system. Cumulative probabilities when several systems are used are not simply the sum of each probability, since in many instances there might be exclusion in more than one system. Calculation of cumulative probabilities is based on the determination of non-exclusion for each system and then applying the formula:

Cumulative Probability = $1 - (1 - P_1)(1 - P_2) \dots (1 - P_n)$, where P_1 , P_2 , and P_n are probabilities of individual exclusions. This formula is used to calculate cumulative probabilities for seven recommended systems (Table 3 page 258). It should be noted that this calculation gives the cumulative probability that at least one of these tests will exclude paternity of a falsely accused man.

Table 3
Cumulative Probability of Exclusion of Non-Fathers

SYSTEMS*	CUMULATIVE PROBABILITY OF EXCLUSION(%)		
	BLACKS	WHITES	JAPANESE
1	17.44	13.42	19.16
1 + 2	33.03	37.19	35.74
1 + 2 + 3	54.50	56.63	52.0
1 + 2 + 3 + 4	54.72	58.17	52.0
1 + 2 + 3 + 4 + 5	56.63	65.88	57.56
1 + 2 + 3 + 4 + 5 + 6	63.37	72.26	64.24
1 + 2 + 3 + 4 + 5 + 6 + 7	91.21	93.34	91.42

*1 = ABO; 2 = Rh; 3 = MNSs; 4 = Kell; 5 = Duffy; 6 = Kidd; 7 = HLA.

IV. Types of Exclusion

A. Exclusion of Paternity

Five types of equally acceptable and definite exclusion of a non-father are possible:

1. The classic type, in which the putative father is lacking a specificity which is present in the child and is absent in the mother so that the specificity found in the child must have been inherited from another father (i.e., child is K+, mother and putative father are K-).
2. Exclusion when the child lacks both specificities found in the putative father (i.e., child is group O, putative father is group AB).
3. The child is homozygous with respect to a specificity not present in both parents (i.e., child is KK, mother is Kk or KK, father is kk).
4. The child lacks a specificity for which the putative father is homozygous (i.e., child is kk, putative father is KK).
5. Indirect exclusion where the study of the parents of the mother and putative father or the latter's siblings more clearly define their genetic makeup. For example, a person of phenotype (group) A_i is either of genotype A₁A₁ or of genotype A₁O. The two genotypes cannot be distinguished by serologic studies on the given person. However, since the two genes are inherited one from each parent, parents of genotypes A₁A₁ and A₁A₁ cannot have a child of genotype A₁O.

B. Exclusion of Maternity

As noted in the following sections, it is possible to exclude maternity in certain serologic patterns involving a given mother-child-putative father set. For example, a woman of group A₁ cannot be the mother of a child of group A₁B, regardless of the group of the father.

In addition to situations involving disputed paternity, the question of excluding maternity arises in cases of alleged child exchange, when the exclusion or probability of maternity is of primary importance.

C. Importance of Genetic Mutation

The possibility of mutation, invalidating the normal inheritance pattern, is very small, estimated to occur once in 40,000 persons. This is so infrequent that it can be ignored in the interpretation of the serologic findings.

V. The Likelihood of Paternity

In order to increase the utility of serologic testing it is desirable to estimate the likelihood of paternity in cases when the putative father is not excluded. Such estimates are admissible evidence in many foreign countries.

In some special situations, as when there is genetic conformity between the child and putative father for an extremely rare specificity (not present in the mother), for example subgroup A, or the rare phenotype ME, the likelihood of paternity is extremely high and obvious without resort to special calculations. Although such situations are not absolute proof of paternity the court can give this evidence due weight.

Usually the situation is not so simple. The serologist has to deal with various circumstances:

1. Calculation of likelihood of paternity in "one-man" cases, i.e., only one man has been named the putative father and he is not excluded. In this case the computation estimates the likelihood that the one man is in fact the father when compared to a random man.
2. Calculation of likelihood of paternity in "multiple men" cases, where more than one man is suspected or known to be involved, has been tested, and has not been excluded. In this case the computation estimates the likelihood of paternity for each of the involved men and the relative probabilities submitted in evidence. In multiple men cases when the man or men other than the accused are not available for testing there is no alternative at this time than to apply the random man formula.

The great majority of situations fall under the first category. One simple but mathematically valid estimation of the likelihood of paternity is that when extended testing providing a very high probability of exclusion fails to exclude an accused man there is a

high probability that he is in fact the father. The likelihood of paternity can be better estimated using gene frequencies.

In "one-man" cases Hummel (4, 5) has proposed the application of the equation of Essen-Möller (6). The plausibility of paternity, *W*, is calculated from:

$$W = \frac{1}{1 + \left(\frac{Y_1}{X_1} \cdot \frac{Y_2}{X_2} \cdot \frac{Y_3}{X_3} \cdots \right)}$$

Where *Y* is the frequency of various blood group phenotypes of men among the normal male population and *X* is the frequency of corresponding phenotypes of true fathers in the given mother-child combination.

The calculation can be carried out from tables of genotype frequencies, but Hummel (5) has prepared tables based on logarithms which facilitate the estimation of probability of paternity.

Example: In a given child-mother-putative father combination the putative father is not excluded. The phenotypes are:

Child: A₁; Rh₀rh (cDe/ede); NN; K⁺; Fy(a+)
 Mother: A₁; Rh₀rh (cDe/ede); MN; K⁻; Fy(a-)
 Man: A₁; Rh₁rh (Cde/ede); MN; K⁺; Fy(a+)

Calculation (using tables of Hummel (5))

1. $\Sigma \log \frac{Y}{X} + 10$ for the blood group systems tested:

A-B-O	9.8739
Rh	9.9477
MN	9.9604
K	8.8865
Fy	9.8176
	<hr/>
	48.4861

2. Subtract 10 (n-1), when n = number of systems used

48.4861
<hr/>
-40.0000
<hr/>
8.4861

3. Value for *W* = about 97 percent
4. Therefore, paternity is very likely (Table 4).

EXHIBIT B

Table 4
Verbal Predicates, According to Hummel (5) for Different Likelihoods of Paternity (W), Comparing the Phenotype Frequency of the Putative Father to That of A Random Man With the Same Blood Group Phenotype

W	LIKELIHOOD OF PATERNITY
99.80 - 99.90	Practically proved
99.1 - 99.75	Extremely likely
95 - 99	Very likely
90 - 95	Likely
80 - 90	Undecided
< 80	Not useful

It must be noted that the calculations proposed by Hummel (5) are based on the comparison of the putative father to a random man, i.e., based on gene frequencies in a given population. This is open to criticisms which are however not serious. *First*, the comparison of the putative father with a "random" man may be criticized inasmuch as a comparison of the putative father with a non-random man might better approximate the true situation. However, it is just as unsound to choose a non-random man as it is to rely on general population frequencies. *Second*, the data of Hummel (5) are for gene frequencies for Caucasians in Germany. While it is predictable that gene frequencies can vary slightly for Caucasians in other areas the differences are so small that the estimates of likelihood of paternity would not vary significantly. Where there is in fact a marked difference in gene frequencies, as in some other racial groups, the tables worked out by Hummel (5) would not necessarily apply. In such situations the new gene frequencies should be substituted into the original formula. *Third*, the formula is based on a comparison of the putative father with one other non-excluded random man who is presumed to have had equal access to the mother. While this will not correspond to the facts in most cases of disputed paternity, it is a useful working hypothesis.

The difficulty judges, juries, and lawyers may experience in interpreting statistical evidence correctly, and possible due process issues under the Fourteenth Amendment of the U.S. Constitution arising in the light of the assumptions just discussed, raise questions regarding the indiscriminate use of such evidence. As indicated in the Recommendations, (See page 283), the matter should be studied further and appropriate safeguards need be developed, to guard against possible misinterpretation of calculations of "likelihood of paternity." It may also be noted that the relatively high exclusion rates that will be produced by the application of the recommended systems will reduce substantially the need for this type of evidence.

VI. Individual Systems

A. ABO (A_1A_2BO) Blood Group System

Tests performed on subjects' red blood cells and serum with appropriate antisera and lectins and cells of known blood group allow all subjects to be classified as belonging in one of the following categories: type O, type A_1 , type A_2 , type B, type A₁B, or type A₂B. The inheritance pattern is well established and allows a tabulation of phenotypes possible or not possible in children from a given mating (Table 5 page 264). In some combinations of serologic factors determined from the mother-child-father combination it is possible to exclude maternity (Table 5 page 264).

The following special serologic features of this system should be noted:

1. Subgroups of A are often incompletely developed at birth, may be adequately developed by three months of age and are usually fully developed by one year of age.
2. Subgroups of A give weak reactions with potent anti-A sera and stronger reactions with Anti-AB, and may be missed entirely if the antiserum is weak.
3. There is an extremely rare genetic type called cis-AB (Reviron and Salmon, Ref 8) or AB* (Salmon, Ref 9) where the transmissions of blood type AB appears to be by a single rather than two separate chromosomes, so that a cis-AB person can then be the parent of an O child and an O person

Table 5
 Exclusion of Paternity and Maternity by the A₁A₂BO System
If the phenotype of the putative father appears in the box corresponding to the child-mother pair the putative father is excluded. If ME appears in the box there is maternal exclusion.

PHENOTYPE OF MOTHER	PHENOTYPE OF CHILD					
	O	A ₁	A ₂	B	A ₁ B	A ₂ B
O	A ₁ B, A ₂ B	O, A ₁ , B, A ₂ B	O, B, A ₁ B	O, A ₁ , A ₂	ME	ME
A ₁	A ₁ B, A ₂ B	None	A ₁ B	O, A ₁ , A ₂	O, A ₁ , A ₂	O, A ₁ , A ₂
A ₂	A ₁ B, A ₂ B	O, A ₁ , B, A ₂ B	A ₁ B	O, A ₁ , A ₂	ME	O, A ₁ , A ₂
B	A ₁ B, A ₂ B	O, A ₁ , B, A ₂ B	O, B, A ₁ B	None	O, A ₁ , B, A ₂ B	O, B, A ₁ B
A ₁ B	ME	None	ME	None	O, A ₁	O, B, A ₁ B
A ₂ B	ME	O, A ₁ , B, A ₂ B	A ₁ B	None	O, A ₁ , B, A ₂ B	O

can be the parent of a cis-AB child. Cis-AB also reacts weakly with anti-B, and more strongly with anti-B from A₁ blood than with anti-B from A₂ blood. In cis-AB individuals who are secretors no B substance is demonstrable in their saliva, and the A substance may also be affected.

- In the rare "Bombay" type the red cells contain no A, B, or H agglutinogens and may be typed as type O. However, the serum contains anti-A, anti-B and anti-H.
- In an occasional leukemic or preleukemic subject there is a change in the reactivity of the red cells which simulates an actual change in blood type, i.e., red cells of a known type A or B person may simulate the reactions of type O cells. Acquired agammaglobulinemia, in leukemia and other diseases, may be characterized by the absence of isoagglutinins in the serum.
- Change of red cell type has also been reported in subjects with colitis or carcinoma of the stomach, characterized by the red cells acquiring weak B characteristics, i.e., a person of type A₁ reacts as if the group were A₁B. This is called "acquired B." Acquired B should be suspected clinically, from the weak reaction with anti-B and from the presence of anti-B isoagglutinin in the serum.
- Failure to demonstrate the expected isoagglutinins in the serum may be due to: (1) acquired or congenital agammaglobulinemia, (2) a weak receptor as in persons of subtype A₁ or A₂, (3) the rare blood chimera situation.

B. The Rh Blood Group System

This system is more complicated than the ABO system and knowledge has progressed from the first basic distinction between Rh+ and Rh- to the characterization of 40 phenotypes.

Because of its complexity the genetics and serologic principles of the system have come to be expressed by two quite dissimilar concepts, the CDE/cde nomenclature of Fisher and Race and the genetic and serologic principles expressed by the Rh-ir nomenclature of Wiener. A review of the differences between the two is given elsewhere (Miale, Ref. 10). Experts in this field use both interchangeably, though some prefer one or the other. As applied

to disputed parentage, both lead to the same conclusion. A comparison of the two is given in Table 6 page 266).

When six antisera are used: anti-Rh₀ (anti-D), anti-rh' (anti-C), anti-rh'' (anti-E), anti-rh^w (anti-C^w), anti-hr' (anti-c), anti-hr'' (anti-e), plus anti-hr (anti-f) to distinguish between a few selected phenotypes, 28 phenotypes can be distinguished corresponding to 55 genotypes. Having determined the phenotype and genotype, or possible genotypes (Miale, Ref. 11), of the child-mother-putative father situation, exclusion or non-exclusion of paternity or exclusion of maternity is decided by standard genetic diagrams.

Example: Child's genotype: $r'r$ (Cde/Cde)

Mother's genotype: $R'r'$ (CDe/Cde)

Putative father's genotype: rr (cde/cde)

Children of the given mother and putative father must have a genetic makeup which reflects the inheritance of one gene from

Table 6
Comparison of CDE/cde and
Rh-hr Nomenclatures

GENES		ANTISERA	
WIENER	FISHER-RACE	WIENER	FISHER-RACE
r	cde	Anti-rh'	Anti-C
r'	Cde	Anti-Rh	Anti-D
r^w	C ^w de	Anti-rh	Anti-E
r''	cdE	Anti-rh ^w	Anti-C ^w
r^y	CdE	Anti-hr'	Anti-c
R^0	cDe	Anti-hr''	Anti-e
R^1	CDe	Anti-hr	Anti-f
R^{1w}	C ^w De		
R^2	cDE		
R^z	CDE		

each parent. Accordingly, the only children possible from this mating must have one of the following genotypes: $R'r$ (CDe/cde) or $r'r$ (Cde/cde). Since the child in this example is of genotype $r'r$ (Cde/Cde) the putative father is excluded.

Tables of exclusion have been constructed based on the more common genotypes of the child-mother-putative father combination (see Wiener and Nieberg, Ref. 12; Miale, Ref. 13; Erskine, Ref. 14), but should not be used to the exclusion of the application of standard genetic diagrams as in the example above.

The following special serologic features of the Rh system should be noted:

1. Many commercial antisera labelled anti-rh' (anti-C) contain both anti-rh' (anti-C) and anti-rh_i (anti-Ce) and may in fact contain a preponderance of anti-rh_i (anti-Ce). Anti-rh_i (anti-Ce) differs from anti-rh' (anti-C) in its inability to agglutinate cells, having the rare agglutinogens rh_y (CdE) and RH_z (CDE) (very rare in Whites, less rare in Mongols). In the rare genotype Rh_zrh (CDE/cde) the cells react with anti-rh' (anti-C) but not with anti-rh_i (anti-Ce).
2. Many rare specificities exist in the system. These define extremely rare genotypes but do not affect the basic pattern.
3. In some individuals the D antigen may fail to react with saline anti-RH₀ though a positive reaction is found with incomplete anti-Rh₀ used in conjunction with an antiglobulin reagent or when slide or rapid tube sera is used. This phenotype, known as D^u, can be caused by interactions with genes on the paired chromosome or in individuals lacking part of the D antigen mosaic. Before excluding parentage of an Rh₀(D) positive child when both alleged parents are Rh₀(D) negative, tests for a weak D or D^u must be done.

C. The MNSs Blood Group System

This system is superficially simple, based on two pairs of codominant allelic genes (M and N) and three phenotypes (M, MN, and N) associated with a second pair of codominant allelic genes (S and s) determining phenotypes S , Ss and s . Transmission is by gene couplets MS , M_s , NS , and N_s . In addition, the agglutinin U, present in all Whites but absent in some Blacks, is associated with

both S and s. Therefore 4 antisera (anti-M, anti-N, anti-S, and anti-s determine nine phenotypes.

The combinations of phenotypes in the child-mother-putative father combination leading to exclusion of paternity or maternity are shown in Table 7. This is based on testing with all four antisera, which gives the highest possible chance of exclusion (about 30 percent). If only three antisera are used (anti-M, anti-N, and anti-S) the chance of exclusion drops to about 24 percent. Table 8 gives the children possible in a given mother-putative father combination when only three antisera are used. The possibilities of establishing maternal exclusion are limited to two situations: a MS woman cannot be the mother of a NS child and a NS woman cannot be the mother of a MS child.

The following special features should be noted:

1. An exception to the rules that M parents cannot have an N child, or that N parents cannot have an M child, occurs in the rare (about 1:40,000, not to be confused with the rate of spontaneous mutation) instances where one of the pair of genes is *M^R*. Gene *M^R* determines an agglutinin lacking M specificity, so the apparent exclusion in case of a putative father who is N with a child who is M might not hold if the father were *M^RN* and the child *MM^R*. Anti-*M^R* serum is not always available, but where exclusion is based only on the MN system all efforts should be made to test for *M^R*. In fact, should gene *M^R* be present in both the father and the child, this would be very strong indication of paternity.
2. The rare allele *M^k* inhibits the expression of the MN as well as the Ss locus.
3. In Blacks, the He (Henshaw) factor should be taken into account. It is present in about 3 percent of Blacks and absent in Whites. Anti-He may be present in anti-M serum so that an N+ and He+ individual might mistakenly be typed as MN.
4. *S^H*, an allele that produces neither S nor s antigen, occurs in about 23 percent of Blacks. No antiserum defining a product of this gene has been found. *S^H* must be taken into consideration when there is an apparent exclusion of parentage of a Black individual who tests as homozygous S or s.
5. Agglutinin U should also be considered in Blacks. It is

Table 7
Exclusion of Paternity (and Maternity) by the MNSs System from Nine Phenotypes Determined by Four Antisera

If the number of the phenotype of the putative father appears in the box corresponding to the child-mother pair the putative father is excluded. If M^R appears in the box there is maternal exclusion.

PHENOTYPE OF MOTHER	PHENOTYPE OF CHILD											
	1 MS	2 Ms	3 MSs	4 NS	5 Ns	6 NSs	7 MNS	8 MNs	9 MNSs			
1. MS	2, 4, 5 6, 8	ME	1, 4, 6 6, 7	ME	ME	ME	1, 2, 3 5, 8	ME	1, 2, 3 4, 7	ME	1, 2, 3 4, 7	1, 2, 3 4, 7
2. Ms	ME	1, 4, 5 6, 7	2, 4, 5 6, 8	ME	ME	ME	ME	1, 2, 3 4, 7	1, 2, 3 5, 8	ME	1, 2, 3 4, 7	1, 2, 3 5, 8
3. MSs	1, 4, 5 6, 7	2, 4, 5 6, 7	4, 5, 6	ME	ME	ME	1, 2, 3 5, 8	ME	1, 2, 3 4, 7	1, 2, 3 5, 8	1, 2, 3 4, 7	1, 2, 3 4, 7
4. NS	ME	ME	ME	1, 2, 3 5, 8	ME	1, 2, 3 4, 7	ME	1, 2, 3 4, 7	1, 2, 3 5, 8	ME	1, 2, 3 4, 7	1, 4, 5 6, 7
5. Ns	ME	ME	ME	ME	1, 2, 3 4, 7	1, 2, 3 5, 7	ME	1, 4, 5 6, 7	1, 2, 3 4, 7	1, 2, 3 5, 8	1, 4, 5 6, 7	2, 4, 5 6, 8
6. NSs	ME	ME	ME	1, 2, 3 4, 7	1, 2, 3 4, 7	1, 2, 3 4, 7	2, 4, 5 6, 8	1, 4, 5 6, 7	1, 2, 3 4, 7	1, 2, 3 5, 8	1, 4, 5 6, 7	4, 5, 6 6, 7
7. MNS	2, 4, 5 6, 8	ME	1, 4, 5 6, 7	1, 2, 3 5, 8	ME	1, 2, 3 4, 7	ME	1, 2, 3 4, 7	1, 2, 3 5, 8	ME	1, 4, 7	1, 4, 7
8. MNs	ME	1, 4, 5 6, 7	2, 4, 5 6, 8	ME	1, 2, 3 4, 7	1, 2, 3 5, 8	ME	1, 4, 7	1, 2, 3 5, 8	ME	1, 4, 7	1, 5, 8
9. MNSs	2, 4, 5 6, 8	1, 4, 5 6, 7	4, 5, 6	1, 2, 3 5, 8	1, 2, 3 4, 7	1, 2, 3 4, 7	2, 5, 8	1, 4, 7	1, 2, 3 4, 7	1, 2, 3 5, 8	1, 4, 7	None

EXHIBIT B

Table 8
Exclusion of Paternity by the MNSs System When Only
Three Antisera Are Used (anti-M, and Anti-N, and anti-S)

MATING	CHILDREN POSSIBLE
MS X MS	MS, M
MS X M	MS, M
M X M	M
MS X MNS	MS, MNS, M, MN
MS X MN	MS, MNS, M, MN
M X MNS	MS, MNS, M, MN
M X MN	M, MN
MS X NS	MNS, MN
MS X N	MNS, MN
M X NS	MNS, MN
M X N	MN
MNS X MNS	MS, M, NS, N, MNS, MN
MNS X MN	MS, M, NS, N, MNS, MN
MN X MN	M, N, MN
MNS X NS	MNS, MN, NS, N
MNS X N	MNS, MN, NS, N
MN X NS	MNS, MN, NS, N
MN X N	MN, N
NS X NS	NS, N
NS X N	NS, N
N X N	N

present in all Whites but absent in a small percentage of Blacks. Blacks who are U negative also lack both S and s. Testing with anti-U serum can be helpful in interracial child-mother-putative father combinations, but only when one is U-negative.

D. The Kell Blood Group System

There are many specificities in this system, but only two are useful in disputed parentage. K and k. The use of two antisera, anti-K and anti-k defines three phenotypes, K, k, and Kk, corresponding to genotypes *KK*, *kk*, and *Kk*. This makes a simple system that needs no further elaboration, exclusion being along classic lines.

The following special features should be noted:

1. Use of both anti-K and anti-k when testing Whites provides a chance of exclusion of about 3.5 percent. Since very few people are *KK*, testing with only anti-K reduces the chance of exclusion by only a few tenths of one percent.
2. The incidence of agglutinin K is extremely small in Blacks and is zero in Chinese and Japanese. In these racial groups no exclusion can be expected on the basis of this blood group system. On the other hand, in an interracial situation the detection of K positively could provide strong likelihood of paternity.

E. The Duffy Blood Group System

Two antisera, anti-Fy^a and anti-Fy^b, define four phenotypes, Fy(a+b-), Fy(a+b+), Fy(a-b+) and Fy(a-b-), determined by allelic genes Fy^a, Fy^b, and Fy. Gene Fy has a high incidence in Blacks (about 78 percent) but has only rarely been identified in Whites, so that in Whites only the first three phenotypes are possible. Exclusion is along classic lines.

The following special features should be noted:

If a person fails to react with either anti-Fy^a or anti-Fy^b (assuming no technical errors), this would be strong evidence that he or she is Black.

F. The Kidd Blood Group System

Two antisera, anti-Jk^a and anti-Jk^b define three phenotypes, Jk(a+b-), Jk(a+b+), and Jk(a-b+), determined by the pair of genes Jk^a and Jk^b. Exclusion is along classic lines.

The following special features should be noted:

A third gene has been postulated, *Jk*, determining a fourth phenotype, *Jk(a-b-)*. This phenotype has been found in only one family of European Whites, and only in single instances in a Filipino woman, a Chinese, and a Hawaiian-Chinese.

G. The HLA System

It has been known for some time that in man there exists a major histocompatibility system (HLA) of great complexity, composed of a series of many closely linked genes. Originally the serologically defined specificities of the HLA system were assigned to two linked loci, each with multiple alleles. These two loci are now designated HLA-A and HLA-B. More recently a third locus, HLA-C, was identified although its individual specificities are not easily identified in typing laboratories in the United States. A fourth locus, HLA-D, has also been identified by mixed lymphocyte culture reactions but is not yet readily detected by serological means. The specificities (or the antigens) which are controlled by genes at each of these four loci are now identified by numbers. When the specificity is first recognized, this is indicated by placing a lower case *w* in front of the number. Later, when general consensus has been reached and the specificity firmly established by the World Health Organization Nomenclature Committee, the *w* is dropped and the number retained.

A "blank" in a genotype might indicate either homozygosity for a single specificity at a locus or, alternatively, it might indicate an inability to identify an antigen. This is usually clarified by family studies. At present, the majority of antigens in the HLA-A and the HLA-B series are known.

The HLA system is one of genetic dominance. Therefore, two antigens or specificities are possible for each segregating locus. At present, as many as eight tissue antigens can be identified in each individual. More practical limitations of tissue typing today, however, include only the specificities of HLA-A and HLA-B (see Tables 9 and 10 pages 273-74). A total of thirty-nine specificities are now recognized within these two loci. Currently available tissue typing trays (for transplantation only) provided by the National Institutes of Health to each of over 120 typing laboratories in the United States allow for identification of 32 of the genotypic specificities.

Table 9
Gene Frequencies of HLA-A Antigens (18)

	CAUCASOID	MONGOLOID	AMERICAN INDIAN	AFRICAN BLACK
HLA-A1	.11	.02	.01	.05
A2	.24	.18	.48	.19
A3	.12	.01	.01	.08
A9	.13	.41	.25	.13
A10	.05	.07	.00	.08
A11	.09	.13	.01	.08
A28	.05	.02	.09	.09
A29	.02	.01	.00	.05
Aw23	.03	.02	.00	.08
Aw24	.10	.34	.25	.05
Aw25	.01	.03	.00	.01
Aw26	.05	.07	.00	.07
Aw30	.04	.02	.02	.16
Aw31	.01	.00	.09	.02
Aw32	.04	.00	.00	.04
Aw33	.04	.07	.04	.07
"Blank"	.04	.06	.02	.06
Aw34*				
Aw36*				
Aw43*				

*Included within frequencies calculated for "blank".

"NOTE: Gene frequencies for each racial group add to more than one because Aw23 and Aw24 are newly described splits or sub-components of A9, and Aw25 and Aw26 are splits or sub-components of A10. Therefore, the gene frequencies for each of these more recently described antigens are included twice in the Table; that is, both are represented with the individual genes and then represented in a combined total as the gene frequency for the A9 and A10 antigen. If the gene frequencies for A9 and A10 are subtracted from the total, then the sum of gene frequencies approach the theoretical value of 1.0 more closely."

Table 10
Gene Frequencies of HLA-B Antigens (18)

	CAUCASOID	MONGOLOID	AMERICAN INDIAN	AFRICAN BLACK
HLA-B5	.01	.09	.11	.08
B7	.11	.02	.01	.12
B8	.07	.01	.00	.04
B12	.11	.03	.01	.12
B13	.02	.04	.00	.01
B14	.03	.00	.01	.03
B18	.07	.01	.01	.03
B27	.04	.04	.03	.00
Bw15	.07	.16	.15	.04
Bw16	.03	.05	.12	.01
Bw17	.06	.03	.01	.21
Bw21	.03	.00	.04	.01
Bw22	.02	.13	.00	.01
Bw35	.10	.06	.23	.06
Bw40	.05	.24	.13	.06
"Blank"	.11	.12	.16	.15
Bw37*				
Bw38*				
Bw39*				
Bw41*				
Bw42*				

*These antigen frequencies are included within the figure given for "blank" for each of the ethnic groups.

Using these trays, more than 255 haplotypes can be recognized with as many as 65,025 genotypes. The number of antigens in the system (Table 11) makes it apparent that the HLA typing system offers the single most potent method for exclusion.

HLA typing is currently evolving so that the specificity of individual test sera must be considered in establishing the

Table 11
Recognized HLA Specificities*

NEW	PREVIOUS	NEW	PREVIOUS
HLA-A1	HL-A1	HLA-B5	HL-A5
HLA-A2	HL-A2	HLA-B7	HL-A7
HLA-A3	HL-A3	HLA-B8	HL-A8
HLA-A9	HL-A9	HLA-B12	HL-A12
HLA-A10	HL-A10	HLA-B13	HL-A13
HLA-A11	HL-A11	HLA-B14	W14
HLA-A28	W28	HLA-B18	W18
HLA-A29	W29	HLA-B27	W27
HLA-Aw19	Li		
HLA-Aw23	W23	HLA-Bw15	W15
HLA-Aw24	W24	HLA-Bw16	W16
HLA-Aw25	W25	HLA-Bw17	W17
HLA-A26	W26	HLA-Bw21	W21
HLA-Aw30	W30	HLA-Bw22	W22
HLA-Aw31	W31	HLA-Bw35	W5
HLA-Aw32	W32	HLA-Bw37	TY
HLA-Aw33	W19.6	HLA-Bw38	W16.1
HLA-Aw34	Malay 2	HLA-Bw39	W16.2
HLA-Aw36	Mo*	HLA-Bw40	W10
HLA-Aw43	BK	HLA-Bw41	Sabell
		HLA-Bw42	MWA
HLA-Cw1	T1	HLA-Dw1	LD 101
HLA-Cw2	T2	HLA-Dw2	LD 102
HLA-Cw3	T3	HLA-Dw3	LD 103
HLA-Cw4	T4	HLA-Dw4	LD 104
HLA-Cw5	T5	HLA-Dw5	LD 105
		HLA-Dw6	LD 106

*The previously reserved specificities W4(4a) and W6(4b) remain w4 and w6. These specificities are closely associated with the B locus.

reliability of the test results. Tissue typing laboratories are widely distributed throughout the country and their facilities could be available for paternity testing. Bulk sera are currently available to qualified individuals upon application to NIAID. Selected antisera are also commercially available. HLA typing has already been used in Europe for paternity exclusion and has been successful in many cases where red cell typing has failed to exclude paternity (15, 16, 17).

As in other genetic systems, HLA sometimes shows an unusually high association between antigens which constitute a single haplotype. This is referred to as genetic disequilibrium. Often such associations are very selective for certain ethnic groups or subpopulations within various geographic regions of the world. There is a considerable amount of data available on haplotype frequencies (Ref. 18, 19, 20). However, even larger numbers of special groups must be typed to provide the statistical basis for analysis of their HLA inheritance. Even when all haplotype frequencies are known, the HLA typing laboratory will still require a determination of the racial and geographic origin of the subjects in order to calculate the probability of exclusion of paternity.

EXCLUSION

The calculation of probabilities for either exclusion or identification of a putative father is complicated by our inability to assign a haplotype designation to the father, even when we have identified all four HLA (A and B) antigens. If a putative father is shown to have both HLA antigens which constitute the paternal haplotype inherited by the child, he still could be excluded if studies of the putative father's father and mother revealed that he had inherited the antigens singly; that is, one from each parent.

Using gene frequencies, it is possible to ascribe a general probability of exclusion by using the formula $(1-P)^4P$ (Ref. 17). The sum of these "probabilities of exclusion" then will give the total probability of exclusion. Using a smaller number of antigen specificities than are generally known today, it was possible to predict that HLA typing would exclude between 76 percent (Ref. 18) to 81 percent (Ref. 17) of men falsely accused of paternity.

LIKELIHOOD OF PATERNITY

The calculation of the statistical likelihood that an accused man is the real father is an even more complicated problem. Here we must calculate the possibility that a man who has both antigens of the suspected paternal haplotype of a child may have inherited these antigens independently, one from each parent (a "Trans" configuration). If they indeed have been inherited together as a true haplotype, they are said to be "Cis" in nature and could have been inherited by a child. If the exact haplotype of the child that has been inherited from the father can be determined, then only those men who have both antigens could possibly be the father. If they have both antigens, the probability that they are in Cis position is $2P \cdot P^2$ (Ref. 16). The probability of Trans configuration of the antigens can also be calculated.

These calculations are made knowing that the two antigens in question have been detected in a putative father. However, they ignore the possibility that the other two antigens have also been identified. If all four HLA antigens are known, then a more precise calculation of Cis or Trans possibilities can be made using haplotype frequency tables. Unfortunately, haplotype frequencies are now known only for the common haplotypes. Until all haplotype frequencies have been identified, we probably must be satisfied with simple calculation of serotype frequencies of antigens to determine the likelihood of paternity. Fortunately, the current data commonly allows for the ready identification of antigen frequencies after serologic identification using lymphocytotoxicity tests. Using antigen frequencies, it is possible to determine the likelihood that a man in the random population would possess both antigens which have been identified as paternal HLA antigens of the child in question. In the case of the rarer antigens, this likelihood can be minimized (often less than 1 percent). However, with some common haplotypes, such as HLA-A3 HLA-B7, the general population demonstrates almost a 7.6 percent frequency. Family studies, of course, would be helpful in confirming that the putative father did indeed inherit the antigens in a Cis configuration and therefore would be the most likely to be the father. However, it is difficult to see how the cooperation of family members could be obtained to allow family testing which would result in identification of paternity as opposed to exclusion.

As for some of the very rare blood group subgroups there are very rare HLA specificities (i.e., HLA-Aw35 or HLA-B14) which, if present in both the child and putative father but absent in the mother would indicate a very high probability of paternity.

Example:

	HLA Antigens Present	Possible Haplotypes
Mother	A2, A9, B5, B12	A2 B 5 A 9 B12 A2 B12 A 9 B 5
Child	A2, A11, B7, B12	A2 B 7 A11 B12 A2 B12 A11 B 7

This child inherited the A2 B12 Haplotype from this mother. Therefore, the real father must have A11 B7 as one of his HLA Haplotypes.

Identification of Putative Father
A3 A11 B7 B5

This male could have the A11 B7 as one of his Haplotypes. So he is not excluded as a possible father. The frequency of B7 in Caucasians is .11 and A11 is .09. The likelihood of these two antigens occurring randomly in the population together is .0099, or about one in a hundred. This would suggest that a putative father who contained these two antigens, that is, A11 B7, would be wrongly identified as the father, approximately one time in a hundred.

Exclusion of Putative Father
A3 A11 B5 B_w15

This man cannot have A11 B7 haplotype and so is excluded as the father.

Finally, the possibility of recombination between antigens of the various allelic series of the HLA complex must be considered by the laboratory which performs the tissue typing. For instance, the recombination rate between antigens of the A and B loci is approximately 0.8 percent (Ref. 21).

H. Serum Protein and Red Cell Enzyme Systems

Numerous polymorphic serum protein and red cell enzyme systems (See Table 1) have been well defined by appropriate family studies

(Ref. 22). The genetics of these systems makes it possible to use them in determining exclusions as outlined in Section IV. Many of these systems are stable in frozen samples. Thus, stored hemolysates or serum can be used when other tests fail to provide an exclusion (Ref. 23).

GROUP SPECIFIC COMPONENT

Electrophoresis on a single polyacrylamide gel can simultaneously distinguish the phenotypes of the Group Specific Component, Transferrin and Albumin systems (Ref. 24). Though only the Gc is routinely useful, the other systems can provide additional data on rare occasions.

HAPTOGLOBIN

Haptoglobin, a serum protein system with an exclusion probability of .18, can be determined simultaneously with ceruloplasmin on polyacrylamide gels stained with an ortho-dianisidine substrate (Ref. 24).

Gm AND Km

Human immunoglobulins contain numerous allotypes which have varying racial distribution. These markers (Gm, Am and Km—formerly known as Inv) can be detected by serologic systems (Ref. 25). Their use is limited in children under six months of age whose markers may not be completely developed and in rare individuals with immunodeficiency states.

ACID PHOSPHATASE

Overnight electrophoresis on starch gel followed by reaction with an appropriate substrate makes it possible to determine the phenotype of the red cell enzyme acid phosphatase which has an exclusion probability of .23 in Whites. Simultaneously the less useful isoenzymes of adenylate kinase, adenosine deaminase and 6-phosphogluconate dehydrogenase can be established from the same gel by reaction with other substrates (Ref. 23).

PHOSPHOGLUCOMUTASE

This stable enzyme found in erythrocyte hemolysates like the previous systems is useful both in determining non-paternity and

probabilities of paternity when gene frequencies for the test population are established. Isoenzyme patterns in this system, as in most of the other systems, can be recorded on photographs.

VII. Procedures and Forms Relating to the Introduction of Evidence

To satisfy the requirements of the law of evidence and to facilitate the introduction of evidence into the courts, it is recommended that standard procedures, including forms, be adopted. The full series of events relating to the testing procedures, beginning with the court's order (or other request) that samples be taken and tests made, covering the laboratory's procedures and ending with the expert's report to the court, must be documented.

It is recommended that only requests for tests from the court, an officer of the court, or an attorney be honored. All parties should appreciate and preserve the confidentiality of the test results. Test results should be provided only to the requesting agency, court, or party or parties unless there is written authorization from the court, or party or parties concerned, for other distribution.

While it may be desirable to develop and encourage universal adoption of standard forms which satisfy all applicable legal requirements, it is probably sufficient to agree on a standard content of forms, along the lines here expressed.

A. The Initial Request

The initial request that blood and other samples be obtained and tested should identify the court or other requesting party, the case, the parties involved in the case and the purpose of the tests (i.e., exclusion of paternity, exclusion of maternity, etc.). The request should direct the named parties to present themselves to the expert or to a laboratory at a designated place, date and time. Each person to be tested should receive a copy of the request. If the testing is to be done elsewhere than in the laboratory where the samples are obtained, the request should state the name and address of the expert to whom the samples should be shipped. The initial request should indicate the party or parties to whom the results of the tests and the opinion of the expert should be sent.

B. Identification of Parties when Testing for Disputed Parentage

It is essential that the persons to be tested in a case of disputed parentage be identified and the identification documented in such a way that there can be no question of identification in court. This can be achieved in various ways, but the following procedure is followed by most experts.

1. All the persons to be tested should be present at the same time if possible and identify each other. If one of the parties cannot be present at the same time he or she should be properly identified when he or she appears for the taking of the sample.
2. The following identification and documentation of identification should be made on an appropriate form or forms:
 - a. Date blood samples are drawn.
 - b. Name, address, social security number (if any), driver's license number (if any), and signature of each party, indicating which is the child (or children), which the mother, and which the putative father (or fathers).
 - c. Permission of each person to be tested for blood and other samples to be obtained, including a statement that he or she understands the purpose of the tests. Typically, the mother or legal guardian will give permission for children or minors.
 - d. Right thumb print of each party.* If the baby is less than one year old a properly prepared footprint or palm print is probably better than a thumbprint.†
 - e. Separate Polaroid photographs of each party, dated and signed on the back and countersigned by a witness. The baby's photograph is signed by the mother.
 - f. If blood samples are drawn elsewhere the above procedures should still be followed it at all possible, as the responsibility for identifying the parties involved rests with the person who obtains the blood samples. It is recommended that the specimens be shipped by registered mail.

*The Sirchie system (Sirchie Laboratories, P.O. Box 23645, Pleasant Hill, California 94523), is convenient.

†The Hollister Disposable Footprinter (Hollister, Inc., 211 E. Chicago Avenue, Chicago, Illinois 60611), is convenient.

C. Identification of Specimens

1. Anticoagulated (sodium citrate or ACD solution) and clotted venous blood is obtained from each party. Five to ten ml. of each should be obtained from adults and older children. In infants and small babies capillary blood can be used, collected with micropipettes.
2. Each tube should be capped, labeled with the name of the donor and his or her relationship to the others (baby, mother, putative father) and initialed by the phlebotomist and the physician responsible for the taking of the sample.
3. Samples drawn elsewhere should be identified in the same way, then countersigned by the person receiving them and the physician responsible for the testing.
4. If saliva is collected the above rules of identification also apply.

VIII. Guidelines for the Expert

It is assumed that no specific technical instructions are necessary for an investigator who is qualified as an expert. Specific caveats are given in each section dealing with test systems. The following guidelines are designed to insure procedural uniformity.

1. Tests should be performed in duplicate, using a different source of blood grouping reagents for each, and each read independently by two observers.
2. An appropriate working form should be used to record the test results and appropriate controls. The form should show the date the tests were performed and the names of the technologists or physicians who performed the tests or read the results.

IX. The Report of the Expert

Based on the test data, the expert sends a written report of his findings and conclusions to the attorneys representing the parties, or to the court if the testing was ordered by the court. All original data and documentation remain in the expert's files. The report should be sufficiently detailed as to the findings and the expert's opinion based on the findings as to minimize questions. If the test shows a strong likelihood of paternity (as defined in Table 4) this evidence should be given to the court along with a description of the method used for calculating likelihood of paternity.

The report shall be received in evidence by stipulation of the parties or by order of the court.

X. Identification of Qualified Laboratories

It is the opinion of the committee that those laboratories which desire to be "accredited" for this purpose should be required to meet rigorous standards of performance. For the purpose of recognition and accrediting of qualified laboratories the committee believes that qualified accrediting agencies can follow past patterns which have proved effective. Standards should be established regarding personnel, space, equipment, reagents and records. A proficiency testing program should be developed that could be offered, through the Center for Disease Control, the College of American Pathologists or other accrediting agencies. It is the opinion of the Committee that all those laboratories which are capable of performing these tests in a satisfactory manner should be permitted to offer this service and be eligible for reimbursement under the several Federal and State programs.

XI. Recommendations

1. It is recommended that this report be adopted by the AMA Board of Trustees and by the American Bar Association.
2. It is recommended that this report be published jointly by the AMA and ABA, in the *Journal of the American Medical Association* and in the *Family Law Quarterly* or other journal designated by the ABA.
3. It is recommended that steps be taken to obtain such Federal, State, or other support as to enable widespread inclusion of HLA studies in the battery of tests used in cases of disputed parentage. This should include not only making available reliable HLA antisera but also provisions for education and continuing education.
4. It is recommended 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 (1) clarify judicial authority to order blood tests and (2) simplify the admissibility in evidence of test results and the probative effect thereof, including the evidentiary value of estimations of "likelihood of paternity."

5. It is recommended that the Department of Health, Education and Welfare and the appropriate agencies on the state and local levels adopt and utilize the findings and recommendations of this report in the administration and implementation of P.L. 93-647 as it relates to the establishment of paternity.
6. It is recommended that the AMA and ABA establish procedures to monitor medical and legal developments in this field to facilitate continuing revision and updating of this report as may at any time appear necessary.

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UNIFORM PARENTAGE ACT

States which have adopted the Act (11/78)

California

Colorado

Hawaii

Montana

North Dakota

Washington

Wyoming

States in which the legislation has been introduced

Oklahoma

SENATE BILL NO. 294—COMMITTEE ON JUDICIARY

MARCH 2, 1979

Referred to Committee on Judiciary

SUMMARY—Provides for establishing parentage and enforcing support of children. (BDR 11-368)

FISCAL NOTE: Effect on Local Government: No. Effect on the State or on Industrial Insurance: No.

EXPLANATION—Matter in *italics* is new; matter in brackets [] is material to be omitted.

AN ACT relating to parentage; providing for the establishment of parentage; providing for enforcement of obligations of support of children; and providing other matter properly relating thereto.

1 WHEREAS, The failure of parents to provide adequate financial sup-
2 port and care for their children is a major cause of financial dependency
3 and a contributing cause to social delinquency; and

4 WHEREAS, The present remedies are slow and uncertain, and result in
5 a burden on the resources of the state, which must provide public assist-
6 ance for basic maintenance when parents fail to meet their obligations;
7 and

8 WHEREAS, It is the duty of the state to conserve money for public
9 assistance by providing reasonable and effective means to enforce the
10 obligations of persons who are responsible for the care and support of
11 their children; and

12 WHEREAS, Determination of parentage is necessary to effective enforce-
13 ment of that responsibility; now, therefore,

14
15 *The People of the State of Nevada, represented in Senate and Assembly,*
16 *do enact as follows:*

17
18 SECTION 1. Chapter 126 of NRS is hereby amended by adding
19 thereto the provisions set forth as sections 2 to 26, inclusive, of this act.

20 SEC. 2. *This chapter applies to all persons, no matter when born.*

21 SEC. 3. *As used in this chapter, unless the context otherwise requires:*

22 1. "Custodial parent" means the parent of a child born out of wed-
23 lock who has been awarded custody of the child or, if no custody award
24 has been made by a court, the parent with whom the child resides.

25 2. "Nonsupporting parent" means the parent of a child born out of
26 wedlock who has failed to provide an equitable share of his child's nec-
27 cessary maintenance, education and support.

EXHIBIT D

627

and proceedings are under the best evidence

3. "Parent and child relationship" means the legal relationship existing between a child and his natural or adoptive parents incident to which the law confers or imposes rights, privileges, duties and obligations. It includes the mother and child relationship and the father and child relationship.

SEC. 4. The parent and child relationship extends equally to every child and to every parent, regardless of the marital status of the parents.

SEC. 5. The parent and child relationship between a child and: 1. The natural mother may be established by proof of her having given birth to the child, or under this chapter, ~~NRS 126.225~~ or NRS 201.025.

2. The natural father may be established under this chapter, NRS ~~126.225~~ or NRS 201.025.

3. An adoptive parent may be established by proof of adoption.

SEC. 6. 1. A man is presumed to be the natural father of a child if: (a) He and the child's natural mother are or have been married to each other and the child is born during the marriage, or within 300 days after the marriage is terminated by death, annulment, declaration of invalidity or divorce, or after a decree of separation is entered by a court.

(b) Before the child's birth, he and the child's natural mother have attempted to marry each other by a marriage solemnized in apparent compliance with law, although the attempted marriage is invalid or could be declared invalid, and:

(1) If the attempted marriage could be declared invalid only by a court, the child is born during the attempted marriage, or within 300 days after its termination by death, annulment, declaration of invalidity or divorce; or

(2) If the attempted marriage is invalid without a court order, the child is born within 300 days after the termination of cohabitation.

(c) After the child's birth, he and the child's natural mother have married or attempted to marry each other by a marriage solemnized in apparent compliance with law, although the attempted marriage is invalid or could be declared invalid, and:

(1) He has acknowledged his paternity of the child in writing filed with the state registrar of vital statistics;

(2) With his consent, he is named as the child's father on the child's birth certificate; or

(3) He is obligated to support the child under a written voluntary promise or by court order.

(d) He receives the child into his home and openly holds out the child as his natural child.

(e) He has partly performed his obligation of support.

(f) He acknowledges his paternity of the child in a writing filed with the state registrar of vital statistics, ~~and the county recorder of the county in which the child was born or in which the birth is expected to occur, on a form provided by the registrar.~~ The registrar shall promptly inform the mother of the filing of the acknowledgment. If the mother does not ~~dispute~~ the acknowledgment within 60 days after being informed thereof, in a writing filed with the state registrar, the acknowledgment becomes

✓
✓

✓

→ consent to
→ does not become

All acknowledgments filed are to be maintained by the State Registrar sealed in a confidential file.

1 effective. Each acknowledgment must be signed by the person filing it, and contain:

3 (1) The name and address of the person filing the acknowledgment;

4 (2) The name and last-known address of the mother of the child;

6 (3) The date of birth of the child, or, if the child is unborn, the month and year in which the child is expected to be born.

8 If another man is presumed under this section to be the child's father, acknowledgment may be effected only with the written consent of the presumed father or after the presumption has been rebutted by a court decree. ~~An acknowledgment of a child makes the child legitimate from birth.~~

11 2. A presumption under this section may be rebutted in an appropriate action only by clear and convincing evidence. If two or more presumptions arise which conflict with each other, the presumption which on the facts is founded on the weightier considerations of policy and logic controls. The presumption is rebutted by a court decree establishing paternity of the child by another man.

18 SEC. 7. 1. If, under the supervision of a licensed physician and with the consent of her husband, a wife is inseminated artificially with semen donated by a man not her husband, the husband is treated in law as if he were the natural father of a child thereby conceived. The husband's consent must be in writing and signed by him and his wife. The physician shall certify their signatures and the date of the insemination, and file the husband's consent with the health division of the department of human resources, where ~~it~~ must be kept confidential and in a sealed file. The physician's failure to do so does not affect the father and child relationship. All papers and records pertaining to the insemination, whether part of the permanent record of a court or of a file held by the supervising physician or elsewhere, are subject to inspection only upon an order of the court for good cause shown.

31 2. The donor of semen provided to a licensed physician for use in artificial insemination of a married woman other than the donor's wife is treated in law as if he were not the natural father of a child thereby conceived.

35 SEC. 8. 1. A child, his natural mother, or a man presumed to be his father under paragraph (a), (b) or (c) of subsection 1 of section 6 of this act, may bring an action:

38 (a) At any time for the purpose of declaring the existence of the father and child relationship presumed under paragraph (a), (b) or (c) of subsection 1 of section 6 of this act; or

41 (b) For the purpose of declaring the nonexistence of the father and child relationship presumed under paragraph (a), (b) or (c) of subsection 1 of section 6 of this act only if the action is brought within a reasonable time after obtaining knowledge of relevant facts, but in no event later than 5 years after the child's birth. After the presumption has been rebutted, paternity of the child by another man may be determined in the same action, if he has been made a party.

48 2. Any interested party may bring an action at any time for the purpose of determining the existence or nonexistence of the father and child

1 relationship presumed under paragraph (d), (e) or (f) of subsection J of
2 section 6 of this act.

3 3. An action to determine the existence of the father and child rela-
4 tionship with respect to a child who has no presumed father under section
5 6 of this act may be brought by the child, the mother or personal repre-
6 sentative of the child, the welfare division of the department of human
7 resources, the personal representative or a parent of the mother if the
8 mother has died, a man alleged or alleging himself to be the father, or the
9 personal representative or a parent of the alleged father if the alleged
10 father has died or is a minor.

11 4. Regardless of its terms, an agreement, other than an agreement
12 approved by the court in accordance with subsection 2 of section 15 of
13 this act between an alleged or presumed father and the mother or child,
14 does not bar an action under this section.

15 5. If an action under this section is brought before the birth of the
16 child, all proceedings must be stayed until after the birth, except service of
17 process and the taking of depositions to perpetuate testimony.

18 SEC. 9. An action to determine the existence of the father and child
19 relationship as to a child who has no presumed father under section 6 of
20 this act may not be brought later than 3 years after the birth of the child,
21 or July 1, 1982, whichever is later. But an action brought by or on behalf
22 of a child whose paternity has not been determined is not barred until 3
23 years after the child reaches the age of majority. Section 8 of this act and
24 this section do not extend the time within which a right of inheritance or
25 a right to a succession may be asserted beyond the time provided by law
26 relating to distribution and closing of decedents' estates or to the deter-
27 mination of heirship, or otherwise.

28 SEC. 10. 1. Each district court has jurisdiction of an action brought
29 under this chapter. The action may be joined with an action for divorce,
30 annulment, separate maintenance or support.

31 2. A person who has sexual intercourse in this state thereby submits
32 to the jurisdiction of the courts of this state as to an action brought under
33 this chapter with respect to a child who may have been conceived by that
34 act of intercourse. In addition to any other method provided by law,
35 personal jurisdiction may be acquired by personal service of summons
36 outside this state or by registered mail with proof of actual receipt.

37 3. The action may be brought in the county in which the child, the
38 mother or the alleged father resides or is found or, if the father is
39 deceased, in which proceedings for probate of his estate have been or
40 could be commenced. The court has jurisdiction whether or not the plain-
41 tiff resides in this state.

42 SEC. 11. The child must be made a party to the action. If he is a
43 minor he must be represented by his general guardian or a guardian ad
44 litem appointed by the court. The child's mother or father may not repre-
45 sent the child as guardian or otherwise. The court may appoint the
46 welfare division of the department of human resources as guardian ad
47 litem for the child. The natural mother, each man presumed to be the
48 father under section 6 of this act, and each man alleged to be the natural
49 father must be made parties or, if not subject to the jurisdiction of the

1 court, be given notice of the action in a manner prescribed by the court
2 and an opportunity to be heard. The court may align the parties.

3 SEC. 12. 1. The court shall endeavor to resolve the issues raised in
4 an action pursuant to this chapter by an informal hearing.

5 2. As soon as practicable after an action to declare the existence or
6 nonexistence of the father and child relationship has been brought, an
7 informal hearing must be held. The court may order that the hearing be
8 held before a master or referee. The public shall be barred from the
9 hearing. A record of the proceeding or any portion thereof must be kept
10 if any party requests or the court orders. Rules of evidence need not be
11 observed.

12 3. Upon refusal of any witness, including a party, to testify under oath
13 or produce evidence, the court may order him to testify under oath and
14 produce evidence concerning all relevant facts. If the refusal is upon the
15 ground that his testimony or evidence might tend to incriminate him, the
16 court may grant him immunity from all criminal liability on account of
17 the testimony or evidence he is required to produce. An order granting
18 immunity bars prosecution of the witness for any offense shown in whole
19 or in part by testimony or evidence he is required to produce, except for
20 perjury committed in his testimony. The refusal of a witness who has
21 been granted immunity to obey an order to testify or produce evi-
22 dence is a civil contempt of the court.

23 4. Testimony of a physician concerning the medical circumstances
24 of the pregnancy and the condition and characteristics of the child upon
25 birth is not privileged.

26 SEC. 13. 1. The court may, upon its own motion or a motion made
27 by or on behalf of any person involved in the controversy, and shall
28 upon the motion of a party, order the mother, child, alleged father or
29 any other person so involved to submit to one or more blood tests to be
30 made, by qualified physicians or other qualified persons, under such
31 restrictions and directions as the court or judge deems proper. Whenever
32 the test is ordered and made, the results of the test are receivable in
33 evidence. The order for the blood tests also may direct that the testimony
34 of the experts and of the persons so examined may be taken by deposi-
35 tion.

36 2. If any party refuses to submit to a blood test, the court may
37 resolve the question of paternity against that party or enforce its order
38 if the rights of others and the interests of justice so require.

39 3. The court, upon reasonable request by a party, shall order that
40 independent tests be performed by other experts qualified as examiners of
41 blood types.

42 4. In all cases, the court shall determine the number and qualifica-
43 tions of the experts.

44 SEC. 14. Evidence relating to paternity may include:

45 1. Evidence of sexual intercourse between the mother and alleged
46 father at any possible time of conception.

47 2. An expert's opinion concerning the statistical probability of the
48 alleged father's paternity based upon the duration of the mother's preg-
49 nancy.

50 3. An expert's opinion concerning blood test results, weighted in

1 accordance with evidence, if available, of the statistical probability of
2 of the alleged father's paternity.

3 4. Medical or anthropological evidence relating to the alleged
4 father's paternity of the child based on tests performed by experts. If a
5 man has been identified as a possible father of the child, the court may,
6 and upon request of a party shall, require the child, the mother and the
7 man to submit to appropriate tests.

8 5. All other evidence relevant to the issue of paternity of the child.

9 SEC. 15. 1. On the basis of the information produced at the pretrial
10 hearing, the judge, master or referee conducting the hearing shall
11 evaluate the probability of determining the existence or nonexistence of
12 the father and child relationship in a trial and whether a judicial declara-
13 tion of the relationship would be in the best interest of the child. On the
14 basis of the evaluation, an appropriate recommendation for settlement
15 must be made to the parties, which may include any of the following:

16 (a) That the action be dismissed with or without prejudice.

17 (b) That the matter be compromised by an agreement among the
18 alleged father, the mother and the child, in which the father and child
19 relationship is not determined but in which a defined economic obliga-
20 tion, fully secured by payment or otherwise, is undertaken by the alleged
21 father in favor of the child and, if appropriate, in favor of the mother,
22 subject to approval by the judge, master or referee conducting the hear-
23 ing. In reviewing the obligation undertaken by the alleged father in a
24 compromise agreement, the judge, master or referee conducting the
25 hearing shall consider the best interest of the child, in the light of the
26 factors enumerated in subsection 5 of section 17 of this act, discounted
27 by the improbability, as it appears to him, of establishing the alleged
28 father's paternity or nonpaternity of the child in a trial of the action. In
29 the best interest of the child, the court may order that the alleged father's
30 identity be kept confidential. In that case, the court may designate a
31 person or agency to receive from the alleged father and disburse on
32 behalf of the child all amounts paid by the alleged father in fulfillment
33 of obligations imposed on him.

34 (c) That the alleged father voluntarily acknowledge his paternity of the
35 child.

36 2. If the parties accept a recommendation made in accordance with
37 subsection 1, judgment must be entered accordingly.

38 3. If a party refuses to accept a recommendation made under subsec-
39 tion 1 and blood tests have not been taken, the court shall require the par-
40 ties to submit to blood tests, ~~if appropriate~~. Thereafter the judge, master
41 or referee shall make an appropriate final recommendation. If a party
42 refuses to accept the final recommendation, the action must be set for
43 trial.

44 4. The guardian ad litem may accept or refuse to accept a recom-
45 mendation under this section.

46 5. The pretrial hearing may be terminated and the action set for
47 trial if the judge, master or referee conducting the hearing finds unlikely
48 that all parties would accept a recommendation he might make under
49 subsection 1 or 3.

50 SEC. 16. 1. An action under this chapter is a civil action governed by

1 the Nevada Rules of Civil Procedure. The mother of the child and the
2 alleged father are competent to testify and may be compelled to testify.
3 Subsections 3 and 4 of section 12 and sections 13 and 14 of this act apply.

4 2. Testimony relating to sexual access to the mother by an unident-
5 fied man at any time or by an identified man at a time other than the prob-
6 able time of conception of the child is inadmissible in evidence unless
7 offered by the mother.

8 3. In an action against an alleged father, evidence offered by him with-
9 respect to a man who is not subject to the jurisdiction of the court con-
10 cerning that man's sexual intercourse with the mother at or about the
11 probable time of conception of the child is admissible in evidence only if
12 the alleged father has undergone and made available to the court blood
13 tests the results of which do not exclude the possibility of his paternity of
14 the child. A man who is identified and is subject to the jurisdiction of the
15 court shall be made a defendant in the action.

16 4. The trial must be by the court without a jury, unless any party
17 demands a jury trial.

18 SEC. 17. 1. The judgment or order of the court determining the
19 existence or nonexistence of the father and child relationship is deter-
20 minative for all purposes.

21 2. If the judgment or order of the court is at variance with the child's
22 birth certificate, the court shall order that a new birth certificate be
23 issued under section 25 of this act.

24 3. The judgment or order may contain any other provision directed
25 against the appropriate party to the proceeding, concerning the duty of
26 support, the custody and guardianship of the child, visitation privilege
27 with the child, the furnishing of bond or other security for the payment
28 of the judgment, or any other matter in the best interest of the child. The
29 judgment or order may direct the father to pay the reasonable expense
30 of the mother's pregnancy and confinement.

31 4. Support judgments or orders ordinarily must be for periodic pay-
32 ments which may vary in amount. In the best interest of the child, a lump
33 sum payment or the purchase of an annuity may be ordered in lieu of
34 periodic payments of support. The court may limit the father's liability
35 for past support of the child to the proportion of the expenses already
36 incurred which the court deems just.

37 5. In determining the amount to be paid by a parent for support of
38 the child and the period during which the duty of support is owed,
39 court enforcing the obligation of support shall consider all relevant factors
40 including the:

41 (a) Needs of the child.

42 (b) Standard of living and circumstances of the parents.

43 (c) Relative financial means of the parents.

44 (d) Earning ability of the parents.

45 (e) Need and capacity of the child for education, including higher
46 education.

47 (f) Age of the child.

48 (g) Financial resources and the earning ability of the child.

49 (h) Responsibility of the parents for the support of others.

50 (i) Value of services contributed by the custodial parent.

(j) Assistance paid by public agencies to support the child, and reasonably related expenses of the mother's pregnancy and confinement.

SEC. 18. The court may order reasonable fees of counsel, experts and the child's guardian ad litem, and other costs of the action and pre-trial proceedings, including blood tests, to be paid by the parties in proportions and at times determined by the court. The court may order the proportion of any indigent party to be paid by the county.

SEC. 19. 1. If existence of the father and child relationship is declared, or paternity or a duty of support has been acknowledged or adjudicated under this chapter, under prior law of this state, or under the law of another jurisdiction, the obligation of the father may be enforced in the same or other proceedings by the mother, the child, the public authority that has furnished or may furnish the reasonable expenses of pregnancy, confinement, education, support or funeral, or by any other person, including a private agency, to the extent he has furnished or is furnishing these expenses.

2. The court may order support payments to be made to the mother, the clerk of the court, or a person, corporation or public agency designated to administer them for the benefit of the child under the supervision of the court.

3. Willful failure to obey the judgment or order of the court is a civil contempt of the court. All remedies for the enforcement of judgments apply.

SEC. 20. The court has continuing jurisdiction to modify or revoke a judgment or order:

- 1. For future education and support; and
- 2. With respect to matters listed in subsections 3 and 4 of section 17 of this act and subsection 2 of section 19 of this act, except that a court entering a judgment or order for the payment of a lump sum or the purchase of an annuity under subsection 4 of section 17 of this act may specify that the judgment or order may not be modified or revoked.

SEC. 21. 1. At the pretrial hearing and in further proceedings, any party may be represented by counsel. The court shall appoint counsel for a party who is financially unable to obtain counsel.

2. If a party is financially unable to pay the cost of a transcript, the court shall furnish on request a transcript for purposes of appeal.

SEC. 22. Any hearing or trial held under this chapter must be held in closed court without admittance of any person other than those necessary to the action or proceeding. All papers and records, other than the final judgment, pertaining to the action or proceeding, whether part of the permanent record of the court or of a file in the welfare division of the department of human resources or elsewhere, are subject to inspection only upon consent of the court and all interested persons, or in exceptional cases only upon an order of the court for good cause shown.

SEC. 23. Any interested party may bring an action to determine the existence or nonexistence of a mother and child relationship. Insofar as practicable, the provisions of this chapter applicable to the father and child relationship apply to that action.

SEC. 24. 1. Any promise in writing to furnish support for a child, growing out of a supposed or alleged father and child relationship, does

not require consideration and is enforceable according to its terms, subject to subsection 4 of section 8 of this act.

2. In the best interest of the child or the mother, the court may, and upon the promisor's request shall, order the promise to be kept in confidence and designate a person or agency to receive and disburse on behalf of the child all amounts paid in performance of the promise.

SEC. 25. 1. Upon order of a court of this state or upon request of a court of another state, the state registrar of vital statistics shall prepare a new certificate of birth consistent with the findings of the court and substitute the new certificate for the original certificate of birth.

2. The fact that the father and child relationship was declared after the child's birth must not be ascertainable from the new certificate but the actual place and date of birth must be shown.

3. The evidence upon which the new certificate was made and the original birth certificate must be kept in a sealed and confidential file and be subject to inspection only upon consent of the court and all interested persons, or in exceptional cases only upon an order of the court for good cause shown.

SEC. 26. 1. If a mother relinquishes or proposes to relinquish for adoption a child who has:

- (a) A presumed father under subsection 1 of section 6 of this act;
 - (b) A father whose relationship to the child has been determined by court; or
 - (c) A father as to whom the child is a legitimate child under this chapter, under prior law of this state or under the law of another jurisdiction, and the father has not consented to the adoption of the child, or relinquished the child for adoption, a proceeding must be brought pursuant to chapter 128 of NRS and a determination made of whether a parent and child relationship exists and if so, if it should be terminated.
2. If a mother relinquishes or proposes to relinquish for adoption a child who does not have:
- (a) A presumed father under subsection 1 of section 6 of this act;
 - (b) A father whose relationship to the child has been determined by court;
 - (c) A father as to whom the child is a legitimate child under this chapter, under prior law of this state or under the law of another jurisdiction; or
 - (d) A father who can be identified in any other way,

or if a child otherwise becomes the subject to an adoption proceeding, the agency or person to whom the child has been or is to be relinquished, the mother or the person having custody of the child, shall file a petition in the district court to terminate the parental rights of the father, unless the father's relationship to the child has been previously terminated and determined not to exist by a court. ~~and protect the interests of~~

3. ~~In order to identify the natural father, the court which is conducting a proceeding pursuant to chapter 128 of NRS shall cause a request to be made of the mother and any other appropriate person. The inquiry must include the following:~~

(a) Whether the mother was married at the time of conception of the child or at any time thereafter.

pursuant to Chapter 128 of NRS.

[petitioner in a Chapter 128 of NRS proceeding]

031

(e) In the petition the petitioner shall inform the court what inquiry was made, of whom, the nature and circumstances of the inquiry and its results.

(b) Whether the mother was cohabiting with a man at the time of conception or birth of the child.

(c) Whether the mother has received support payments or promises of support with respect to the child or in connection with her pregnancy.

(d) Whether any man has formally or informally acknowledged or declared his possible paternity of the child.

4. If, after the inquiry, the natural father is identified to the satisfaction of the court, or if more than one man is identified as a possible father, each must be given notice of the proceeding in accordance with subsection 6 of this section or with chapter 128 of NRS, as applicable. If any of them fails to appear or, if appearing, fails to claim custodial rights, his parental rights with reference to the child must be terminated. If the natural father or a man representing himself to be the natural father, claims custodial rights, the court shall proceed to determine custodial rights.

5. If, after the inquiry, the court is unable to identify the natural father or any possible natural father and no person has appeared claiming to be the natural father and claiming custodial rights, the court shall enter an order terminating the unknown natural father's parental rights with reference to the child. Subject to the disposition of any appeal, upon the expiration of 6 months after an order terminating parental rights is issued under this subsection, or chapter 128 of NRS, the order cannot be questioned by any person in any manner or upon any ground, including fraud, misrepresentation, failure to give any required notice or lack of jurisdiction of the parties or of the subject matter.

6. Notice of the proceeding must be given to every person identified as the natural father or a possible natural father in the manner provided by law and the Nevada Rules of Civil Procedure for the service of process in a civil action, or in any manner the court directs. Proof of giving the notice shall be filed with the court before the petition is heard.

SEC. 27. NRS 41.210 is hereby amended to read as follows:
41.210 The district courts [are hereby authorized to] may establish the date [of birth,] and place of birth [and parentage] of any person [and shall, in their orders, so decree and appoint] in the manner hereinafter provided.

SEC. 28. NRS 41.220 is hereby amended to read as follows:
41.220 1. Every person desiring to have the date [of his birth, the] or place of his birth [or his parentage established shall] established must file a verified petition accompanied by his fingerprint chart, with a small recent photograph attached, in the district court of the county in which such person [shall have] has been a resident for at least 6 months prior thereto, which petition [shall] must recite the circumstances involved and the desire of the petitioner in relation thereto.

2. Upon the filing of a petition in the office of the county clerk, the county clerk shall give notice of the hearing thereof by posting notices thereof in three public places in the county, which notice [shall] must provide for the hearing of the petition at any time after the posting of the notices for 15 days. In addition to the posting of the notice the clerk shall send a copy of the notice to the National Office of Vital Statistics

(e) delete
Such failure shall constitute abandonment of the child as provided in Chapter 128 of NRS.

delete

at Washington, D.C., and one to the sheriff of the county in which the petition is filed.

SEC. 29. NRS 41.240 is hereby amended to read as follows:
41.240 After the court [shall deem] deems the evidence presented upon the hearing of the petition sufficient to grant the prayer of the petitioner, it shall make an order establishing the facts of the matter as presented to the court. Any decree rendered by the court as establishing the date [of birth, the] or place of birth, or [parentage, or any of such,] both, of any person [shall be] is prima facie evidence thereof for all purposes in which the date [of the person's birth,] or place of birth [or parentage] of the person may be at issue.

SEC. 30. NRS 56.020 is hereby amended to read as follows:
56.020 Whenever it [shall be] is relevant in a civil or criminal action to determine the parentage or identity of any [child,] adult person or corpse [,] or the identity of any child, the court, by order, may direct any party to the action and the person involved in the controversy to submit to one or more blood tests, to be made by [duly] qualified physicians or other [duly] qualified persons, under such restrictions and directions as the court or judge [shall deem] deems proper. Whenever such test is ordered and made, the results thereof [shall be] are receivable in evidence. [, but only in cases where definite exclusion is established.] The order for [such] the blood tests also may direct that the testimony of [such] the experts and of the persons so examined may be taken by deposition. The court shall determine how and by whom the costs of [such examination shall] the examination must be paid.

SEC. 31. NRS 126.040 is hereby amended to read as follows:
126.040 1. [The mother may recover from the father] Either parent may recover from the other a reasonable share of the necessary support of the child.

2. In the absence of a previous demand in writing (served personally or by registered or certified letter addressed to the [father,] nonsupporting parent at his last-known residence), not more than [2] 3 years' support furnished [prior to] before the bringing of the action may be recovered from the [father,] nonsupporting parent.

SEC. 32. NRS 126.050 is hereby amended to read as follows:
126.050 The obligation of [the father as herein provided creates also] a cause of action on behalf of the legal representatives of the mother, support imposed on the parents of a child born out of wedlock also creates a cause of action on behalf of the legal representatives of either of them, or on behalf of third persons or public agencies furnishing support or defraying the reasonable expenses thereof, where [paternity] parentage has been judicially established by proceedings brought by [the mother] either parent or by or on behalf of the child or by the authorities charged with [its] his support, or where [paternity] parentage has been acknowledged by [the father] either parent in writing or by the performance of [the] the parent's obligations. [imposed upon him.]

SEC. 33. NRS 126.060 is hereby amended to read as follows:
126.060 1. The obligation of [the father] a parent other than that under the laws providing for the support of poor relatives is discharged

532

1 by complying with a judicial decree for support or with the terms of a
2 judicially approved settlement.

3 2. The legal adoption of the child into another family discharges the
4 obligation [for the period subsequent to] of his natural parents after the
5 adoption.

6 Sec. 34. NRS 126.070 is hereby amended to read as follows:

7 126.070 1. The obligation of [the father, where his paternity] a
8 parent, where parentage has been judicially established in his lifetime, or
9 has been acknowledged by him in writing or by the part performance of
10 his obligation, is enforceable against his estate in such an amount as the
11 court may determine, having regard to the age of the child, the ability
12 of the [mother] custodial parent to support [it,] the child, the amount
13 of property left by the [father,] deceased parent, the number, age, and
14 financial condition of the lawful issue, if any, and the rights of the
15 [widow, if any.] surviving spouse, if any, of the deceased parent.

16 2. The court may direct the discharge of the obligation by periodical
17 payments or by the payment of a lump sum.

18 Sec. 35. NRS 126.080 is hereby amended to read as follows:

19 126.080 Proceedings to compel support by [the father] a nonsup-
20 porting parent may be brought in accordance with [NRS 126.090 to
21 126.290, inclusive,] this chapter and no filing fees or other fees,
22 charges [,] or court costs [shall] may be charged for bringing or main-
23 taining the [same,] proceeding, but the usual filing fees, charges [,] or
24 court costs [, as aforesaid,] may [by the court] be assessed by the court
25 against the [father] nonsupporting parent and enforced with the other
26 provisions of the judgment as provided in NRS 126.250. They [shall not
27 be] are not exclusive of other proceedings. [that may be available on
28 principles of law or equity.]

29 Sec. 36. NRS 126.190 is hereby amended to read as follows:

30 126.190 If the defendant fails to appear, [the security for his appear-
31 ance shall be forfeited and shall be applied on account of the payment of
32 the judgment, but the trial shall proceed as if he were present; and the
33 court shall upon the findings of the judge or the verdict of the jury make
34 such orders as if the defendant were in court.] the court may proceed as
35 if he were present and hear the complaint. The court shall require the
36 plaintiff to establish the facts, and shall give full and careful considera-
37 tion to all evidence presented and the rights and claims of the plaintiff,
38 defendant and children, and the best interests of the child or children
39 involved. The court shall, upon its own findings or the verdict of the
40 jury, make such orders as it would make if the defendant were present.

41 Sec. 37. NRS 126.200 is hereby amended to read as follows:

42 126.200 If after the complaint [the mother dies or] has been filed,
43 the plaintiff dies, becomes insane or cannot be found within the juris-
44 diction, the proceeding does not abate, but the child [shall] must be
45 substituted as complainant.

46 Sec. 38. NRS 126.210 is hereby amended to read as follows:

47 126.210 In case of the death of the defendant, [after the preliminary
48 hearing,] the action may be prosecuted against the personal representa-
49 tives of the deceased with like effect as if he were living, subject as
50 regards the measure of support to the [provision of NRS 126.080 except

1 that no arrest of such personal representative shall take place or be
2 be required of him.] provisions of this chapter. No personal represen-
3 tive may be ~~arrested or required to post a bond~~ required to post a bond

4 Sec. 39. NRS 126.240 is hereby amended to read as follows:

5 126.240 1. The court may require the payments to be made to
6 [mother,] custodial parent, public agency or to some person or corpora-
7 tion to be designated by the court as trustee.

8 2. If the welfare division of the department of human resources
9 provided money for the support of a child, the court shall direct the
10 payment be made to the division. ~~The~~

11 3. The payments [shall be directed to] must be made to a trustee
12 the [mother] custodial parent does not reside within the jurisdiction
13 the court [~~in another State.~~]

14 3.] or has assigned his right to receive support to a public agency

15 4. The trustee shall report to the court annually, or [oftener,] ma-
16 often, as directed by the court, the amounts received and paid over.

17 Sec. 40. NRS 126.250 is hereby amended to read as follows:

18 126.250 1. The court may require [the father] a nonsupporting
19 parent to give security, by bond with sureties, for the payment of a
20 judgment. In default of such security, when required, the court may
21 commit him to jail. After 1 year the person so committed may be dis-
22 charged (in accordance with the law relating to the discharge of insolvent
23 debtors), but his liability to pay the judgment [shall not be there-
24 affected.] is not affected by his release.

25 2. Instead of committing the [father] nonsupporting parent to jail
26 or as a condition of his release from jail, the court may commit him to
27 the custody of the sheriff of the county, upon such terms regarding pay-
28 ments and personal reports, as the court may direct. Upon violation
29 of the terms imposed, the court may commit or recommit the [father]
30 nonsupporting parent to jail.

31 Sec. 41. NRS 126.325 is hereby amended to read as follows:

32 126.325 ~~shall~~. The district attorney of the county of residence of
33 child shall take such action as is necessary to establish [paternity
34 such] parentage of the child and locate [, apprehend or] and take legal
35 action against a deserting or nonsupporting parent of [such child.]
36 child when requested to do so by the custodial parent or a public agency
37 which provides assistance to the parent or child.

38 2. In a county where the district attorney has deputies to aid him
39 in the performance of his duties, such district attorney shall designate his-
40 self or a particular deputy as responsible for performing the duties
41 imposed by subsection 1.

42 3. The district attorney and his deputies do not become representa-
43 tives of the parent or child by reason of performing their duties pursuant
44 to this chapter. The privilege between lawyer and client does not apply
45 from the performance of those duties.

46 Sec. 42. NRS 126.330 is hereby amended to read as follows:

47 126.330 A criminal prosecution brought in accordance with the pro-
48 visions of NRS [126.300 or 126.310 shall not be] 201.020 to 201.020
49 inclusive, is not a bar to, or [be] barred by, civil proceedings to com-

for civil
contempt.

and of the
residence of
the non support-
parent

1 support; but money paid toward the support of the child under the provisions of NRS [126.320 shall] 201.020 to 201.080, inclusive, must be allowed for and credited in determining or enforcing any civil liability.

2
3
4 Sec. 43. NRS 127.040 is hereby amended to read as follows:
5 127.040 1. [Written] Except as provided in NRS 127.090, written
6 consent to the specific adoption proposed by the petition or for relinquishment to an agency authorized [under NRS 127.050, duly] to accept relinquishments acknowledged by the person or persons consenting, [shall be] is required from:
7
8 (a) Both parents if both are living;
9 (b) One parent if the other is dead; or
10 (c) [The mother only of a child born out of wedlock except that if parental rights have been established in a court of competent jurisdiction by the father of such a child, pursuant to NRS 41.530, his consent shall be required; or
11
12 (d)] The guardian of the person of a child [duly] appointed by a court of competent jurisdiction.
13
14 2. Consent [shall not be] is not required of a parent who has been adjudged insane for [a period of 2 years, and] 2 years if the court is satisfied by proof that such insanity is incurable.
15
16 Sec. 44. NRS 128.095 is hereby amended to read as follows:
17 128.095 If the putative father of a child fails to acknowledge the child or petition to have his parental rights established in a court of competent jurisdiction [pursuant to NRS 41.530 prior to] before a hearing on a petition to terminate his parental rights, he is presumed to have intended to abandon the child.
18
19 Sec. 45. NRS 130.245 is hereby amended to read as follows:
20 130.245 If the obligor asserts as a defense that he is not the father of the child for whom support is sought and it appears to the court that the defense is not frivolous, and if both of the parties are present at the hearing or the proof required in the case indicates that the presence of either or both of the parties is not necessary, the court may adjudicate the paternity issue [.] as provided in chapter 126 of NRS. Otherwise the court may adjourn the hearing until the paternity issue has been adjudicated.
21
22 Sec. 46. NRS 201.020 is hereby amended to read as follows:
23 201.020 1. Any husband or wife who, without just cause, deserts, willfully neglects or refuses to provide for the support and maintenance of his [wife] spouse in destitute or necessitous circumstances; or any parent who without lawful excuse deserts or willfully neglects or refuses to provide for the support and maintenance of his or her legitimate or illegitimate minor child or children or any parent who without lawful excuse deserts or willfully neglects or refuses to provide for the support and maintenance of his or her legitimate or illegitimate minor child or children who upon arriving at the age of majority are unable to provide themselves with support and maintenance due to infirmity, incompetency or other legal disability contracted prior to their reaching the age of majority, shall be punished:
24
25 [1.] (a) If the conduct for which the defendant was convicted persisted for less than 6 months, for a misdemeanor or, if such conduct

1 persisted for more than 6 months, for a gross misdemeanor or, if for
2 more than 1 year as provided in subsection X (b)
3 [2.] (b) For any subsequent offense by imprisonment in the state
4 prison for not less than 1 year nor more than 6 years, or by a fine of not
5 more than \$1,000, or by both fine and imprisonment.
6 2. In addition to other orders which the court may make relative to
7 the defendant's obligation to provide support to his spouse and children,
8 the court may impose an intermittent sentence on a person found guilty
9 of a violation of subsection 1 if it finds that such a sentence would be in
10 the best interest of the defendant's spouse and child or children.
11 Sec. 47 NRS 201.025 is hereby amended to read as follows:
12 201.025 1. The district attorney of the county of residence of a
13 spouse or minor child who has been deserted, neglected or for whom
14 support and maintenance are refused as proscribed by NRS 201.020
15 shall take such action as is necessary to establish [paternity] the parent-
16 age of such child and locate, apprehend [or] and take legal action against
17 [a] the deserting or nonsupporting parent. [of such applicant or recipi-
18 ent.]
19 2. In a county where the district attorney has deputies to aid him
20 in the performance of his duties, such district attorney shall designate
21 himself or a particular deputy as responsible for performing the duties
22 imposed by subsection 1.
23 Sec. 48. NRS 41.530, 56.010, 126.010, 126.020, 126.090 to 126.-
24 110, inclusive, 126.130 to 126.180, inclusive, 126.220, 126.230, 126.-
25 270 to 126.320, inclusive, 126.340, 126.350, 126.370, 126.380, ~~126.170~~
26 and ~~134.180~~ are hereby repealed.

and

Basically this bill is good, but there are a few problems.

<u>Page</u>	<u>Line</u>	<u>Section</u>	<u>Comment</u>
2	10-11	5.1	NRS 126.325 and 201.025 refer specifically to paternity and do not address maternity.
2	15-19	6.1(a)	Slight conflict with NRS 440.280.4 in that allowance is not made for court determination which may be different.
2	20-29	6.1(b)	Same comment as 6.1(a) also see NRS 122.090 about valid marriages and NRS 122.140 about legitimation.
2	30-39	6.1(c)	.1 Comparable to NRS 440.320 .2 How does anyone know he consented unless he files the acknowledgement required in 6.1(c).1 .3 The writer's voluntary promise appears to be the same thing as the acknowledgement in 6.1(c).1 When a court order is issued, this situation is covered by NRS 440.280.6.
2	43-49	6.1(f)	This conflicts with NRS 440.280.5 in that the mother must consent in writing before the acknowledgement can be filed. Also, the county recorders office does not need to be burdened with a duplication of the work of the state registrar. This will just add confusion.
3	1-7		
3	8-11	6.1	A paternity is established which is in conflict with an existing birth record. The state registrar cannot establish a new birth certificate on the new paternity. A change in paternity can only be accomplished by court order.
3	12-17	6.2	See last comment above.
3	18-34	7.1&.2	NRS 440.280.4 agrees with this section. Are they both necessary?
7	21-23	17.2	NRS 440.280.6 agrees with this section.
9	7-18	25	NRS 440.280.6, 440.320, 440.325 agree with this. However, if under section 6.1(f), the county recorder also gets the acknowledgement of paternity, he would also be required to seal and secure the document. The county recorders do not have provisions for this activity in their offices.
10	33-49	27 & 28	Elimination of the power of the court to establish parentage in accordance with NRS 41.210-.260 would hamper the operations of the state registrar. We use this mechanism to establish the facts of birth for adults whose birth record was never filed.
10	49	28	There is no National Office of Vital Statistics in Washington, D.C. I suggest you change this to the state registrar in the alleged state of birth.

15

25-26

48

Although this does not professionally affect the vital records office, I wonder what would be the reason for repealing the inheritance and succession statutes for illegitimate children.

NRS 134.170, 134.180

A. B. 229

ASSEMBLY BILL NO. 229—ASSEMBLYMEN HAYES, SENA,
WAGNER, CAVNAR, GETTO, HORN, MALONE AND
STEWART

JANUARY 30, 1979

Referred to Committee on Judiciary

SUMMARY—Removes distinction based on sex from NRS 156.040.
(BDR 13-572)

FISCAL NOTE: Effect on Local Government: No.
Effect on the State or on Industrial Insurance: No.



EXPLANATION—Matter in *italics* is new; matter in brackets [] is material to be omitted.

AN ACT relating to missing persons; removing an implication that such persons
are males only; and providing other matters properly relating thereto.

*The People of the State of Nevada, represented in Senate and Assembly,
do enact as follows:*

- 1 SECTION 1. NRS 156.040 is hereby amended to read as follows:
- 2 156.040 In appointing such trustee, the court shall prefer the [wife]
- 3 spouse of the missing person. or [her] the spouse's nominee, and, in the
- 4 absence of a [wife,] spouse, some relative of the missing person.

ASSEMBLY BILL NO. 244—ASSEMBLYMEN HAYES,
STEWART AND MALONE

FEBRUARY 1, 1979

Referred to Committee on Judiciary

SUMMARY—Removes distinctions based on sex from NRS 41.200. (BDR 3-564)
FISCAL NOTE: Effect on Local Government: No.
Effect on the State or on Industrial Insurance: No.



EXPLANATION—Matter in *italics* is new; matter in brackets [] is material to be omitted.

AN ACT relating to the compromising of claims of minors; removing distinctions based on sex from NRS 41.200; and providing other matters properly relating thereto.

The People of the State of Nevada, represented in Senate and Assembly, do enact as follows:

1 SECTION 1. NRS 41.200 is hereby amended to read as follows:
2 41.200 1. Where a minor [shall have] *has* a disputed claim for
3 money against a third person, [the father, or if the father be dead or
4 the parents of the minor are living separate and apart and the mother
5 has care or custody of the minor, then the mother of the minor,] *either*
6 *parent, or if the parents of the minor are living separate and apart, then*
7 *the custodial parent, or if no custody award has been made, the parent*
8 *with whom the minor is living, or if a general guardian or guardian of*
9 *the estate of [such] the minor has been appointed, then [such] that*
10 *guardian, [shall have] has the right to compromise [such] the claim. [,*
11 *but before the compromise shall be valid or of any effect the same shall*
12 *be.] Such a compromise is not effective until it is approved by the district*
13 *court of the county where the minor resides, or [in the event that] if*
14 *the minor is not a resident of the State of Nevada, then by the district*
15 *court of the county where the claim was incurred, upon a verified peti-*
16 *tion in writing, regularly filed with the court. If the court approves [such]*
17 *the compromise, the [district] court may direct the money to be paid*
18 *to the father, mother or guardian of such minor, with or without the*
19 *filing of any bond, or it may require a general guardian or guardian ad*
20 *litem to be duly appointed and the money to be paid to [such] the*
21 *guardian or guardian ad litem with or without a bond as in the discretion*
22 *of the court seems to be in the best interests of the minor.*
23 2. The clerk of the district court shall not charge any fee for filing
24 a petition for leave to compromise or for placing the [same] *petition*
25 upon the calendar to be heard by the court.

ASSEMBLY BILL NO. 245—ASSEMBLYMEN HAYES, COULTER,
WESTALL, WAGNER, GETTO, SENA, HORN AND STEW-
ART

FEBRUARY 1, 1979

Referred to Committee on Judiciary

SUMMARY—Removes distinctions based on sex from NRS 146.010 and
146.030. (BDR 12-571)

FISCAL NOTE: Effect on Local Government: No.
Effect on the State or on Industrial Insurance: No.

EXPLANATION—Matter in *italics* is new; matter in brackets [] is material to be omitted.

AN ACT relating to the support of families of decedents; removing distinctions
between widows and widowers as to rights of support; and providing other
matters properly relating thereto.

*The People of the State of Nevada, represented in Senate and Assembly,
do enact as follows:*

1 SECTION 1. NRS 146.010 is hereby amended to read as follows:
2 146.010 Except as provided in NRS 125.140, when any person
3 [shall die,] *dies* leaving a [widow] *surviving spouse* or a minor child or
4 children, the [widow,] *surviving spouse*, child or children [shall be] *are*
5 entitled to remain in possession of the homestead and of all the wearing
6 apparel and provisions on hand of the family, and all of the household
7 furniture, and [shall also be] *are also* entitled to a reasonable provision
8 for their support, to be allowed by the [district judge at chambers or in
9 court.] *court*.

10 SEC. 2. NRS 146.030 is hereby amended to read as follows:

11 146.030 1. If the whole property exempt by law [be] *is* set apart
12 and [should not be] *is not* sufficient for the support of the [widow,]
13 *surviving spouse*, child or children, the [district] court [or judge] shall
14 make such reasonable allowance out of the estate as [shall be] *is* nec-
15 essary for the maintenance of the family according to their circumstances
16 during the progress of the settlement of the estate, which, in case of an
17 insolvent estate, shall not be longer than 1 year after granting letters of
18 administration.

19 2. If the [widow] *surviving spouse* or any minor child has a reason-
20 able maintenance derived from other property, and there are other per-
21 sons entitled to a family allowance, the allowance shall be granted only
22 to those who have not such maintenance, or such allowance may be
23 apportioned in such manner as may be just.

ASSEMBLY BILL NO. 246—ASSEMBLYMEN HAYES
AND COULTER

FEBRUARY 1, 1979

Referred to Committee on Judiciary

SUMMARY—Removes distinction based on sex from
NRS 194.010. (BDR 16-573)

FISCAL NOTE: Effect on Local Government: No.
Effect on the State or on Industrial Insurance: No.

EXPLANATION—Matter in *italics* is new; matter in brackets [] is material to be omitted.

AN ACT relating to criminal responsibility; removing a special provision for married women; and providing other matters properly relating thereto.

The People of the State of Nevada, represented in Senate and Assembly, do enact as follows:

- 1 SECTION 1. NRS 194.010 is hereby amended to read as follows:
2 194.010 All persons are liable to punishment except those belonging
3 to the following classes:
4 1. Children under the age of 8 years.
5 2. Children between the ages of 8 years and 14 years, in the absence
6 of clear proof that at the time of committing the act charged against them
7 they knew its wrongfulness.
8 3. Idiots.
9 4. Lunatics and insane persons.
10 5. Persons who committed the act or made the omission charged
11 under an ignorance or mistake of fact, which disproves any criminal
12 intent, where a specific intent is required to constitute the offense.
13 6. Persons who committed the act charged without being conscious
14 thereof.
15 7. Persons who committed the act or made the omission charged,
16 through misfortune or by accident, when it appears that there was no
17 evil design, intention or culpable negligence.
18 8. [Married women, unless the crime be punishable with death, act-
19 ing under the threats, command or coercion of their husbands; provided,
20 it appear, from all the facts and circumstances of the case, that violent
21 threats, command or coercion were used.
22 9.] Persons, unless the crime [be] is punishable with death, who
23 committed the act or made the omission charged under threats or
24 menaces sufficient to show that they had reasonable cause to believe, and
25 did believe, their lives would be endangered if they refused, or that they
26 would suffer great bodily harm.

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ASSEMBLY BILL NO. 259—ASSEMBLYMEN HAYES, WESTALL,
WAGNER, GETTO, HORN AND STEWART

FEBRUARY 2, 1979

Referred to Committee on Judiciary

SUMMARY—Extends annuity provision in partnerships to both widows and widowers. (BDR 7-566)

FISCAL NOTE: Effect on Local Government: No.
Effect on the State or on Industrial Insurance: No.

EXPLANATION—Matter in *italics* is new; matter in brackets [] is material to be omitted.

AN ACT relating to partnerships; extending provision for annuity to both widows and widowers; and providing other matters properly relating thereto.

The People of the State of Nevada, represented in Senate and Assembly, do enact as follows:

- 1 SECTION 1. NRS 87.070 is hereby amended to read as follows:
2 87.070 In determining whether a partnership exists, these rules
3 ~~shall~~ apply:
4 1. Except as provided by NRS 87.160 persons who are not partners
5 as to each other are not partners as to third persons.
6 2. Joint tenancy, tenancy in common, tenancy by the entireties, joint
7 property, common property, or part ownership does not of itself establish
8 a partnership, whether such coowners do or do not share any profits
9 made by the use of the property.
10 3. The sharing of gross returns does not of itself establish a partner-
11 ship, whether or not the person sharing them have a joint or common
12 right or interest in any property from which the returns are derived.
13 4. The receipt by a person of a share of the profits of a business is
14 prima facie evidence that he is a partner in the business, but no such
15 inference ~~shall~~ may be drawn if such profits were received in payment:
16 (a) As a debt by installments or otherwise,
17 (b) As wages of an employee or rent to a landlord,
18 (c) As an annuity to a ~~widow~~ *surviving spouse* or representative of
19 a deceased partner,
20 (d) As interest on a loan, though the amount of payment vary with
21 the profits of the business,
22 (e) As the consideration for the sale of a good will of a business or
23 other property by installments or otherwise.

ASSEMBLY BILL NO. 267—ASSEMBLYMEN COULTER, SENA,
WAGNER, FIELDING, HORN, PRENGAMAN, MALONE,
POLISH, BANNER, BRADY, HAYES, GETTO, DINI, JEFF-
REY, PRICE AND WESTALL

FEBRUARY 2, 1979

Referred to Committee on Judiciary

SUMMARY—Provides additional penalty for certain crimes against blind
and aged persons. (BDR 16-509)

FISCAL NOTE: Effect on Local Government: No.
Effect on the State or on Industrial Insurance: No.

EXPLANATION—Matter in *italics* is new; matter in brackets [] is material to be omitted.

AN ACT relating to crimes; providing an additional penalty for certain crimes
against blind and aged persons; and providing other matters properly relating
thereto.

*The People of the State of Nevada, represented in Senate and Assembly,
do enact as follows:*

- 1 SECTION 1. Chapter 193 of NRS is hereby amended by adding
2 thereto a new section which shall read as follows:
3 1. *Any person who commits the crime of:*
4 (a) *Assault;*
5 (b) *Battery;*
6 (c) *False imprisonment;*
7 (d) *Kidnaping;*
8 (e) *Manslaughter;*
9 (f) *Mayhem;*
10 (g) *Murder;*
11 (h) *Robbery;*
12 (i) *Sexual assault; or*
13 (j) *The infamous crime against nature,*
14 *against any person who is aged or blind shall be punished by imprison-*
15 *ment in the county jail or state prison, whichever is applicable, for a term*
16 *equal to and in addition to the term of imprisonment prescribed by statute*
17 *for the crime. The sentence prescribed by this section must run consecu-*
18 *tively with the sentence prescribed by statute for the crime.*
19 2. *This section does not create any separate offense but provides an*