The Ohio State University

VOLUME 2

NUMBER 3

The Use of the Blood Tests for Disputed Paternity in the Courts of Ohio¹

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The increasing use of the human blood groups for forensic purposes makes the knowledge of their hereditary transmission, of their bearing in affiliation cases, and of their status both in the United States and abroad of vital importance to the legal profession. The fact that the present authors have been able to make two exclusions in ten affiliation suits in Ohio shows that such tests are gaining recognition and importance in state legal circles. The application of the blood group test to medicolegal cases therefore warrants the presentation of a complete and understandable summary of all information pertaining to the making of the tests. The present paper, then, in addition to presenting detailed summaries of the ten cases thus far carried out in Ohio, offers a complete discussion of the scientific basis for blood grouping tests.

Within the red blood cells of human beings are to be found specific substances which are demonstrable only through their

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³ Professor of Medical genetics, Ohio State University College of Medicine; author of "Blood Grouping in Relation to Clinical and Legal Medicine"; Chairman, National Research Council Committee on Human Heredity. reactions with other specific substances present in human serum. The cellular properties, called *aggultinogens*, and the substances in the serum, called *agglutinins*, were first recognized by Karl Landsteiner in 1900. The result of his discovery was the classification of human blood into four separate and distinct groups, designated O, A, B, and AB. This classification was based therefore on the presence in human blood of two agglutinogens, A and B, and of two corresponding agglutinins, *a* and *b*. Individual bloods contain either substance A or B, both A and B, or neither A nor B. Where a particular agglutinogen is present in the cells the corresponding agglutinin is absent from the serum; vice versa, where a particular agglutinin is present in the serum the corresponding agglutinogen is absent from the cells.

The presence or absence of a particular agglutinogen is determined by testing the unknown blood against sera containing known agglutinins. If the agglutinogen in question is present, the red blood cells will clump up into large bunches in the serum. This phenomenon of bunching is known as "agglutination." If the agglutinogen in question is absent, the cells will remain evenly distributed in the serum: that is, agglutination does not take place. The reactions must be read through a microscope.

That Mendelian inheritance was involved in the production of the four blood groups was suggested by Epstein and Ottenberg in 1908. Von Dungern and Hirszfeld first pointed out the importance of this fact to forensic practice for use in affiliation cases. The theory that the blood groups are inherited as triple allelomorphs was postulated by Bernstein (1925). The factors for the production of substance A and substance B are determined by three allelomorphic genes, A, B, and R, where A and B are dominant and R recessive. These allelomorphs interact in such a way that when both dominants are present both substances will be present in the blood of the individual. The four blood groups are genetically divisible into six genotypes: group O, genotype RR; group A, genotypes AA and AR; group B, genotypes BB and BR; group AB, genotype AB. The following two laws must hold, therefore:

(1) The agglutinogens A or B cannot appear in the blood of a child unless present in the blood of one or both parents.

(2) The combinations, group AB parent with group O child, and group O parent with group AB child are impossible.

Table I shows the ten possible crosses, the children expected and the children not possible from any given mating.

TABLE I

Offspring Possible and Not Possible from Different A-B Matings

Cross	Children Possible	Children Not Possible
OxO	0	A, B, AB
O x A	O, A	B, AB
O x B	O, B	A, AB
O x AB	A, B	O, AB
A x A	O, A	B, AB
A x B	O, A, B, AB	• • • • • •
A x AB	A, B, AB	0
B x B	O, B	A, AB
B x AB	A, B, AB	O´
AB x AB	A, B, AB	0

Studies of many thousands of families throughout the world have proved the tenability of this theory, and it has been accepted as the hereditary basis of the four blood groups (Snyder, 1929; Wiener, 1935).

In 1928, the idea occurred to Landsteiner and Levine, that agglutinogens might be present in human red blood cells for which no agglutinins existed in human serum. If such agglutinogens did exist, they could be demonstrated by injecting washed red cells into experimental animals. The substances produced by the animals against agglutinogens are known as immune agglutinins. Observations were made in experiments with anti-human-blood immune serum from rabbits. These tests revealed the presence of two agglutinable properties in human blood unrelated to the agglutinogens A and B. The newly discovered agglutinogens were called M and N.

Landsteiner and Levine concluded from their first study of families that the agglutinable factors M and N are constitutional properties that are inherited as Mendelian characters.

The work of Landsteiner and Levine, Schiff, Shigeno, Thomsen and Clausen, Wiener and Vaisberg, and Hyman has shown conclusively that the agglutinogens M and N are inherited as a single pair of allelomorphic genes with dominance lacking. Thus an individual can belong to either group M, group N, or group MN. No individual's blood lacks both M and N.

TABLE II

Offspring Possible and Not Possible from Different M-N Matings

Cross	Children Possible	Children Not Possible
MN x MN	MN, M, N	
MN x N	MN, N	м
MN x M	MN, M	N
M x N	, MN	M, N
M x M	M	MN, N
NxN	N	MN, M

Since this theory has been proved correct the following two rules must hold:

(1) Agglutinogen M cannot appear in the blood of a child unless present in the blood of one or both parents; the same rule holds for agglutinogen N.

(2) An M parent cannot give rise to an N child, and an N parent cannot give rise to an M child.

Table II shows the six possible crosses, the children expected, and the children not possible from any given mating.

The discovery of the M and N agglutinogens made possible

the classification of human blood into twelve different groups. They are as follows:

> OM ON OMN AM AN AMN BM BM BN BN ABM ABN ABMN

Once the type of inheritance involved was ascertained for both sets of blood groups the most immediate forensic application was to affiliation cases. In order for a physiologic trait to be applicable in medico-legal cases it must fulfill three requirements: (1) it must be so clear-cut that all qualified observers will arrive at the same conclusions in regard to its presence or absence; (2) it must be constant throughout life; and (3) it must be inherited according to exact laws. The human blood groups fulfill all of these requirements. No two competent and well-trained observers could possibly disagree on the quite visible reactions of a blood test, for the reactions are of two kinds: agglutination either occurs or it does not occur. The varying degrees of agglutination can create no doubt as to the positiveness of the reaction. The agglutinogens are constant throughout life, appearing as early as the third month of foetal life and never changing. The types of inheritance involved have been carefully worked out and found to obey exact laws. The blood groups are thus far the only physiologic traits that can be used with certainty in affiliation cases.

Now just how can these blood groups be applied to pater-

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nity cases? Are they capable of showing that a certain man is the father of a certain child? Or are they capable of showing that a certain man could not be the father of a certain child? Inasmuch as many men belong to the same blood groups, blood grouping cannot be used to prove paternity. However, the presence of an agglutinogen in the blood of a child which is not present in the blood either of the mother or of the putative father would automatically clear the man of the charge of paternity. Consequently the blood group tests for paternity

TABLE III

PROBABILITIES OF PROVING NON-PATERNITY WHEN THE TYPE OF THE WRONGFULLY ACCUSED MAN IS KNOWN (After Wiener)

Putative Father of Type	Chances of Proving Non-Paternity
OM	50.71 per cent
ON	56.00
OMN	25.18
AM	40.37
AN	46.67
AMN	9.05
BM	43.59
BN	49.56
BMN	14.38
ABM	58.36
ABN	62.77
ABMN	36.81
Unknown	33.07

are exclusion tests. If, for example, a child has agglutinogen A in its blood, and the mother's blood lacks it, then we know that it must be present in the blood of the father. If the accused man does not have the substance in question he cannot possibly be the father. Only in exclusions, then, can the tests be used as legal evidence.

What are the chances, therefore, of a man proving his innocence when confronted with a paternity suit? It has been estimated that, with the use of both sets of blood groups, the average chance of proving non-paternity is approximately one THE USE OF BLOOD TESTS

out of three. It must be borne in mind that in the majority of cases the man admits relations with the woman but denies any responsibility for the conception of the child. In other words, conception was possible but highly improbable. Therefore, the possibility of an exclusion in one out of three cases is not a small number.

Child	Mother	Group to which Father cannot belong
0	0	AB
0	Α	AB
0	В	AB
Α	0	O, B
Α	В	O, B
В	0	O, A
В	Α	O, A
AB	А	O, A
AB	В	O, B
AB	AB	O

TABLE	IV
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Medico-Legal	ASPECT	OF THE	A-B	REACTION
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TABLE	v
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Child	Mother	Group to which Father cannot belong
M	М	N
М	MN	Ν
N	N	Μ
N	MN	Μ
MN	М	Μ
MN	N	Ν

MEDICO-LEGAL ASPECT OF THE M-N REACTION

Wiener has prepared a list of the probabilities of proving non-paternity when the type of the wrongfully accused man is known. It is given here in Table III.

A man of group AMN has less than one chance in ten to prove his innocence; a man of group OM has one chance in two; and so on. On the average, as was stated before, the chances of proving non-paternity are one out of three. Though about two-thirds of paternity cases will not be subject to solution, it is still advisable and valuable to make the blood tests in all cases for the sake of the one-third that might be settled.

The medico-legal aspects of the A - B, and M - N reactions are presented in Tables IV and V, respectively. The groups to which the mother and child belong and correspondingly to which the real father could not possibly belong are shown. Consequently a man accused of paternity who falls into one of the groups in the third column of the table corresponding to a particular combination of mother and child could not be the father of the child.

Foreign jurisprudence seems to be more responsive to scientific discoveries that have direct forensic applications than does American jurisprudence. American courts appear to look for precedents before accepting the admissibility in scientific evidence and do not always examine the validity of that evidence on its own merits. In Europe and Asia, however, the courts scientifically scrutinize any data that might be used as absolute and conclusive evidence. For this reason the blood group tests for non-paternity were legally recognized abroad many years ago and are widely applied in affiliation cases. Let us first investigate the status of the tests in foreign countries before discussing their medico-legal applications in the United States and particularly in Ohio.

The Latin countries of Europe (France, Italy, and Spain) still hold to the old code: *pater semper incertus*. The courts will "not allow the possibility of a biological proof of fatherhood," so any proof of non-paternity based on an inherited physiologic trait is not acceptable. However, a few cases where the tests were used have been recorded for Trieste, Italy, when the Austro-Hungarian Civil Law was in effect. Only in 1931 did the Supreme Italian Court of Cassation make the following statement in regard to the value of the tests for determining non-paternity: "As regards the reliability of the results obtained by this method, the latest studies and investigations show that though the determination of the blood groups affords no positive evidence for a declaration of affiliation in a given case, it does on the other hand furnish incontrovertible evidence for the exclusion of this relationship when the child's blood group does not agree, according to a definite scheme, with that of the supposed father."

The tests are most widely used in Teutonic countries. Schiff reports as many as 5000 cases in Germany in 1929, of which more than 2500 were in Berlin. Werkgartner reports more than 1500 cases handled in Austria up to 1929.

The courts in these countries call for the blood group tests at the beginning of the legal proceedings, for an exclusion on the basis of the tests is the only evidence necessary. Lattes says that "the formula of the German Code lends itself particularly well to biological evidence, for the question before the Courts is usually stated in the negative: 'Is it clearly impossible (offenbar unmöglich) for Mr. X to be the father of this child?'"

"The Landgericht of Duisberg in 1928 asserted that 'there can be no doubt whatever as to the evidential value of these tests."

The Prussian Kammergericht accepts the blood group tests as absolute and conclusive evidence for non-paternity. The Reichsgericht, supreme German Court, in 1930, upheld the validity of the tests.

Austria and the Scandinavian countries have legally recognized the reliability of the tests in evidence and are using them for all affiliation cases.

Though the Commissar for Soviet Justice in 1926 prohibited the use of the tests for paternity cases on the basis of their not affording absolute proof the decision was reversed in 1927 and the tests are now regarded as conclusive evidence for nonpaternity.

The first paternity case in the British Isles in which the tests were used took place in 1932. In the Dublin Circuit Court a man was proved not to be the father of a certain child and was declared not guilty on the basis of the blood groups. The blood group tests, therefore, are applied medicolegally in Denmark, Norway, Sweden, Germany, Austria, Danzig, Lithuania, Czechoslovakia, Holland, Japan, Russia, Belgium, Ireland, and in a few instances, Italy.

In Germany, Denmark, and other foreign countries laws are being drawn up to regulate the use of the tests in the courts. The tests are rather difficult to make and expert skill is needed. If put into the hands of incompetent investigators disastrous results may follow. Thus the same scientific and open-minded attitude with which European courts have recognized and made use of the applicability of the blood group tests to affiliation cases has been devoted to safeguarding the actual making of the tests so that no miscarriage of justice will result. The tests have been legally centralized in Bavaria, Saxony, Würtemberg, and Hamburg. This procedure eliminates the possibility of the tests being made by incompetent workers.

It is only in the past few years that American Courts have begun to accept the admissibility in evidence of the blood group tests for non-paternity. Precedents were looked for only in our own Federal and State proceedings, and not being found, requests for the blood tests were refused. However, a few courts knowing the advantages accruing to criminal cases from the use of fingerprint and blood stain identifications, critically examined the blood group test data, and granted court orders for the making of such tests. The first of such cases of which we have any knowledge occurred January 2, 1934, before Supreme Court Justice Steinbrink of the State of New York.⁴ The present authors' first case occurred in February 1934, in the Court of Common Pleas, Pickaway County, Ohio. Further

⁴ Beuschel v. Manowitz, 151 Misc. 899, 271 N.Y.S. 277 (1934), reversed 241 App. Div. 888, 272 N.Y.S. 165 (1934), leave to appeal denied, 265 N.Y. 509, 193 N.E. 295 (1934). In Commonwealth v. Zammarelli, 17 Pa. Dist. and Co. Reports, 229 (1931) a blood-grouping test voluntarily submitted to, was used as evidence of nonpaternity and a verdict of guilty set aside as against the weight of evidence. The most recent decision approving such tests is to be found in South Dakota v. Damm, 3 LW, Index 814 (April 16, 1936).

cases both in Ohio and other states followed, in which court orders were granted for the making of the tests. However, in none of these early cases did it become necessary for the court to rule upon the admissibility in evidence of the tests, since they either failed to clear the defendant, or, where they did exclude him, the case was voluntarily withdrawn by the plaintiff.

Among the first cases in which the results of the blood tests actually were admitted as evidence and resulted in a verdict of not guilty for the defendant, was the authors' sixth case (see Table VI). In this case Mrs. M., a widow, gave birth to a child some five years after her husband's death. She accused her late husband's brother of being the father of the child. He denied this, and the Court of Domestic Relations, Franklin County, Ohio, granted a court order for the making of the tests. The test on the basis of the M-N reactions showed that the man might be the father of the child as far as these agglutinogens were concerned. The M-N test, therefore, does not constitute evidence in this case. The test on the basis of the A-B reactions. however, indicated that he could not possibly be the father, because he did not have in his blood agglutinogen B, which was present in the blood of the child but not present in that of the mother. The true father of this particular child would have to have agglutinogen B in his blood. On the basis of this evidence, the court instructed the jury to bring in a verdict of not guilty for the defendant.

In the case just cited it should be noted that although the defendant *could* be the father on the basis of the M-N tests, this is of no significance in view of the fact that he *could not* be the father on the basis of the A-B tests. As was previously pointed out, exclusion can be made whenever there is present in the blood of the child an agglutinogen which is not present either in the blood of the mother or in that of the alleged father. It is of course assumed in such cases that the alleged mother is the true mother of the child.

The other case of the present authors in which an exclusion

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was made is listed as number 10 in Table VI, also referred from the Court of Domestic Relations, Franklin County, Ohio. In this case, Mr. R., father of two grown daughters, sought a divorce from his wife on the grounds that a child born to her recently was not his. A court order for the making of the tests was granted. Again the results of the M-N tests failed to exclude the man, but the results of the A-B tests did exclude him, as may be seen from the table. This case, which is still pending, is complicated by the fact that the Ohio Supreme Court has held

BLOOD TI	ests Made	BY THE	AUTHORS	FOR]	Disputed	PATERNITY
	C	ASES IN T	'HE STATE	of O)HIO	

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			Blo			
	Date	Source	Mother	Child	Alleged Father	Conclu- sion
ı.	2/ 6/'34	Court of Common Pleas,				
		Pickaway County, Ohio	A, N	0, N	0, N	Negative
2.	2/13/'34	Court of Common Pleas,				-
		Licking County, Ohio	A, MN	0, M	0, M	Negative
3.	4/25/°34	Criminal Court,				
		Vinton County, Ohio	A, MN	A, MN	0, M	Negative
4.	6/19/'35	Court of Domestic Rela-	_			.
		tions, Franklin County, Ohio	B, MN	в, м	о, м	Negative
5.	6/26/'35	Physician	A, MN	O, MN	A, N	Negative
6.	10/24/'35	Court of Domestic Rela-				
		tions, Franklin County, Ohio	A, MN	B, MN	0, M	Positive
7.	11/19/'35	Court of Domestic Rela-				
		tions, Franklin County, Ohio	B, N	B, MN	O, MN	Negative
8.	11/29/'35	Physician	0, M	A, MN	A, N	Negative
9.	12/11/'35	Court of Domestic Rela-				
		tions, Franklin County, Ohio	O, MN	O, MN	A, M	Negative
10.	4/22/ ' 36	Court of Domestic Rela-				
		tions, Franklin County, Ohio	A, N	AB, MN	А, М	Positive

that "a child conceived and born in wedlock, where the husband has access to the wife, is presumed to be the child of the husband."

Table VI lists all of the cases which have been referred to the authors for blood group determinations. Of the ten cases, exclusions were possible in only two. It is worthy of note that in each of the eight other cases the defendant admitted relations with the woman, but denied responsibility for the conception of the child. Among these eight cases, as can be seen from the

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table, in no instance was there present in the blood of the child any agglutinogen which was absent both from the blood of the mother and from that of the alleged father. Therefore no exclusion was possible in these cases.

The fact that so many cases have been referred to the authors is an indication of a progressive attitude towards blood grouping tests on the part of the Courts of Ohio. In only a few other states is such an attitude discernible. The states of New York and Wisconsin have taken the lead in this movement, having already passed legislation along these lines. Legislation is pending in the states of Illinois, Montana, and New Jersey.

The full texts of the New York law and the Wisconsin law are appended to this article. There is likewise presented a set of model laws designed by Dr. A. S. Wiener of the National Research Council Committee on Human Heredity, for the use of blood grouping tests in illegitimacy cases, civil cases, and criminal cases.

THE NEW YORK LAWS

Section 1. Section sixty-seven of article five of chapter six hundred fifty-nine of the laws of nineteen hundred ten, entitled "An act in relation to the inferior courts of criminal jurisdiction in the city of New York, defining their powers and jurisdiction and providing for their officers," as such section and article were thus restated and renumbered by chapter seven hundred fortysix of the laws of nineteen hundred thirty-three, is hereby amended by inserting therein a new subdivision, to be subdivision one-a, to read as follows:

I-a. The court, on motion of the defendant, shall order the making of one or more blood-grouping tests by a duly qualified physician and the results thereof may be received in evidence.

2. This act shall take effect immediately. (N. Y. Laws, 1935, Ch. 197, effective March 22, 1935; see also Domestic Relations Law, §126-a, effective same date).

Section 1. The civil practice act is hereby amended by in-

serting therein a new section, to be section three hundred six-a, to read as follows:

306-a. Blood tests. Wherever it shall be relevant to the prosecution or defense of an action, the court, by order, shall direct any party to the action and the child of any such party to submit to one or more blood tests, to be made by duly qualified physicians and under such restrictions and directions, as to the court or judge shall seem proper. The order for such blood tests may also direct that the testimony of the persons so examined may be taken by deposition pursuant to this article.

2. This act shall take effect immediately. (N. Y. Civ. Pract. Act, §306-a; N. Y. Laws, 1935, Ch. 196, effective March 22, 1935).

The Wisconsin Law

Section 1. Two new sections are added to the statutes to read:

166.105. Evidence; blood tests. Whenever it shall be relevant to the prosecution or the defense in an illegitimacy action, the trial court, by order, may direct that the complainant, her child and the defendant submit to one or more blood tests to determine whether or not the defendant can be excluded as being the father of the child. The result of the test shall be receivable in evidence, but only in cases where definite exclusion is established. The tests shall be made by duly qualified physicians or other qualified persons, not to exceed three, to be appointed by the court and to be paid by the county. Such experts shall be subject to cross-examination by both parties after the court has caused them to disclose their findings to the court or to the court and jury. Whenever the court orders such blood tests to be taken and one of the parties shall refuse to submit to such test, such fact shall be disclosed upon the trial unless good cause is shown to the contrary.

325.23. Blood tests in civil actions. Whenever it shall be relevant in a civil action to determine the paternity or identity of any child, person, or corpse, 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 qualified persons and under such restrictions and directions, as the court or judge shall deem proper. Whenever such test is ordered and made the results thereof shall be receivable in evidence, but only in cases where definite exclusion is established. The order for such blood tests may also direct that the testimony of such experts and of the persons so examined may be taken by deposition. The court shall determine how and by whom the costs of such examinations shall be paid.

Section 2. This act shall take effect upon passage and publication. (Wis. Laws, 1935, Ch. 351, effective Aug. 12, 1935).

Model Laws for the Use of Blood Grouping Tests in Certain Illegitimacy Cases, Civil Cases, and Criminal Cases

Prepared by Alexander S. Wiener, M.D., of the National Research Council Committee on Human Inheritance

1. Blood tests in illegitimacy actions. The court, on motion of the defendant, shall order the making of one or more blood grouping tests by a duly qualified physician or other qualified person, and the results thereof shall be received in evidence. The cost of the tests is to be met by the defendant, who may select the expert from a list drawn up by the State Medical Society of individuals who have proved their ability to do such tests. Whenever the court orders such blood tests to be taken and one of the parties shall refuse to submit to such test, such fact shall be disclosed upon trial unless good cause is shown to the contrary.

2. Blood tests in civil actions. Whenever it shall be relevant to the prosecution or defense in a civil action to determine the parentage or identity of any child, person, or corpse, the court, by order, shall direct any party to the action and any person involved in the controversy to submit to one or more blood LAW JOURNAL - MAY, 1936

tests, to be made by only a qualified physician or other qualified person, and under such restrictions and directions as the court or judge shall deem proper. Whenever such test is ordered and made, the results thereof shall be receivable in evidence. The court shall determine how and by whom the costs of such examinations shall be paid.

SCIENTIFIC BIBLIOGRAPHY

- Bernstein, F., 1925. Zeitschr. f. nd. Abst.—u. Vererbungslehre 37: 237.
- Hyman, H. S., 1935. Journ. Immun. 29:223.
- Landsteiner, K., 1900. Centralbl. f. Bakt. 27:361.
- Landsteiner, K., and Levine, P., 1928. Journ. Exp. Med. 47:757.
- Lattes, L., 1932. Individuality of the Blood. London, Oxford University Press.
- Snyder, L. H., 1929. Blood Grouping in Relation to Clinical and Legal Medicine. Baltimore, The Williams and Wilkins Co.
- Wiener, A. S., 1935. Blood Groups and Blood Transfusion. Springfield, Charles C. Thomas.

LEGAL BIBLIOGRAPHY

- Lee, 1926. Amer. Bar Assoc. Journ. 12:441.
- Evidential Value of Blood Groups, Feb. 13, 1932. New York Law Journ.
- Editorial, 1933. Proof of Paternity by Blood Tests and Other Methods. New York Law Journ. 86:602.
- Herzog, 1931. Medical Jurisprudence, chapter 51. Indianapolis.
- Wigmore, 1934. Treatise on Evidence, 1923-1933 Supplement to 2nd edition. Sections 165a and 165b, pp. 149-160, Boston.
- Minutes of Session on Forensic Medicine, 1934. Journ. Amer. Med. Assoc. 103:46.
- Beuschel v. Manowitz, Jan. 2, 1934. New York Law Journ. 151
 Misc. 899, 271 N.Y.S. 277 (1934), reversed 241 App. Div. 888, 272 N.Y.S. 165 (1934), leave to appeal denied 265 N.Y. 509, 193 N.E. 295 (1934).
- Commonwealth v. Zammarelli, 17 Pa. Dist. and Co. Reports 229 (1931).
- South Dakota v. Damm, 3 LW, Index 814 (April 16, 1936).