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## Blood Grouping Tests for Non-Paternity

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The use of blood grouping tests in disputed paternity, filial relationship, personal identification, forensic medicine, and other medicolegal problems has become increasingly frequent in the past twenty years [1-7]. Several recent articles concerned with pitfalls and exceptions in the interpretation of the laws pertaining to this highly accurate science have appeared [8-10]. Since the major medicolegal impact is in relation to disputed paternity, this report presents a study of an additional 1000 cases in this area. The previous report in 1963 [11] emphasized the fact that only 10 percent of defendants in paternity proceedings requested blood grouping tests to substantiate their denial, whereas a statistical study indicated that approximately 40 percent of men were in fact not the fathers in the actions brought before the courts. To fail to demand a blood grouping test is indeed to disregard a most important defense, and thus fail to provide the most substantial evidence of non-paternity.

The present report, covering the experience of the past ten years, repeats the findings presented in 1963. In addition, the use of **Kell** [12] and **S** factors [13] have added an occasional exclusion not previously obtained. The statistics using the ABO, MN, and Rh-Hr systems yield a 51 percent probability of exclusion of falsely accused men. With the added use of anti-**Kell** and anti-**S** serum, the probability rate has been raised to 54 percent<sup>2</sup> [14]. Table 1 presents the results of the 1000 cases tested.

The value of each of the separate blood groups in establishing non-paternity differs from the theoretical expectancy in that these cases were not random studies, but represented denials of paternity where a considerable number of the men were not the fathers of the involved children. Table 2 presents these differences, comparing the theoretical chance of exclusion with the actual results found in 1963 and in 1973.

The importance of performing complete groupings using all the usually available antisera is shown in Table 3. The Rh-Hr system provides the greatest number of exclusions, and the use of the entire spectrum of available anti-Rh serums is essential. These include at least anti-Rh<sub>0</sub>, -rh', -rh'', -hr', and -hr''. The contribution of each of these subgroups to the rate of exclusion is shown in Table 4.

### Discussion

The importance of performing blood grouping tests to prove non-paternity should not be overlooked, since a considerable number of defendants can be exonerated by such means. The results of these tests when they indicate non-paternity can decide the issue in many jurisdictions; in others a finding of non-paternity is given great evidentiary weight.

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<sup>2</sup> Wiener's Formula [7] is  $P = 1 - (1 - P_1)(1 - P_2)(1 - P_3) \dots$  where  $P$  = chance of exclusion in each system.

TABLE 1—Results obtained in 1000 cases of disputed paternity.

Total Cases Tested	1000
Total Exclusions	132 = 13.2%
Probability of Exclusions	= 54 %
Total Probably Excluded	244 = 24 %
Total "No Show" <sup>a</sup>	63 = 6.3%
Total Probably Falsely Accused	307 = 30.7%

<sup>a</sup> Mother failed to appear.

TABLE 2—Theoretical and actual probability of exclusions.

	Theoretical, %	Actual, % (1973)	Actual, % (1963)
ABO	18	30	43
MN	20	30	30
Rh-Hr	25	56	51
K + S	8	6	Not Done

TABLE 3—Exclusions obtained by blood group systems.  
(Some exclusions obtained in 2 or 3 systems.)

	Total Tests	Exclusion	ABO	MN	Rh-Hr	S + K
Caucasians	368	50(14%)	14(30%)	14(30%)	31(62%)	3(6%)
Negroids	474	61(13.0%)	22(36%)	18(30%)	30(50%)	4(6%)
Hispanic	158	21(13.0%)	3(14%)	7(33%)	13(62%)	4(20%)
Total	1000	132(13.2%)	39(30%)	39(30%)	74(56%)	11(9%)

TABLE 4—Exclusions obtained in subgroups of Rh-Hr system.

	Total Rh Exclusions	Rh <sub>0</sub>	rh'	rh''	hr'	hr''
Caucasians	31/50 (62%)	2(7%)	10(33%)	15(50%)	1(3%)	3(10%)
Negroids	30/61 (50%)	5(16%)	13(42%)	8(30%)	4(7%)	0
Hispanic	13/21 (62%)	4(33%)	7(50%)	1(10%)	1(10%)	0
Total	74/132(56%)	11(15%)	30(40%)	24(33%)	6(7%)	3(3%)

Tests for these purposes must include the ABO, MNS, Rh-Hr, and Kell systems. The Rh-Hr system is particularly helpful, having established the exclusion of paternity in 56 percent of the cases excluded. This represents almost double the efficiency of the ABO and MNS systems. The use of at least the five standard subgroup antisera of the Rh-Hr system is essential. The testing sera must be of proven reliability and each test carefully performed and properly controlled with test cells of known antigen content. Familiarity with the use of special antisera such as anti-rh<sup>w</sup> [15], anti-hr [16], anti-rh<sub>i</sub> [17], anti-M<sup>e</sup> [18,19] and with the techniques for the detection of the rare "Bombay" [20] bloods and deleted genes [21] is necessary. Other special techniques such as titration and scoring [22] and extensive family studies (including in some cases testing the parents of the litigants) [23] must be known. Such areas should be considered before an exclusion is tendered, and the expert must be prepared to face the challenge of supporting his conclusions in court [24,25].

There is good evidence in the literature to justify the requirement that all litigants in paternity disputes submit to blood grouping tests [26]. The protection of a falsely accused man in paternity suits that are frequently motivated by desires for support, extortion, blackmail, or character defamation, demands that such blood grouping tests be made mandatory.

## Summary

This study presents the findings in 1000 cases of blood grouping tests for non-paternity. A total of 132 (13.2 percent) of exclusions were obtained by the use of ABO, MNS, Rh-Hr, and Kell systems. The theoretical probability of exclusion of falsely accused men has been raised to 54 percent by the addition of K and S to the usual systems used. Subgroups of the Rh system were particularly valuable, resulting in 56 percent of the exclusions obtained. The need for mandatory blood grouping tests in bastardy proceedings is emphasized.

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