

Blood Groups and Leprosy

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The problem of the relation between blood groups and disease has been the subject of many investigations. An important paper appeared as early as 46 years ago (Buchanan and Higley, 1921). Specific studies about blood groups and leprosy also date back to the twenties (Puate, 1927-28 and others). Since that time the relation between the ABO blood groups and this disease has been tested in different countries and at different times. But no one has ever tried to analyse all these data. The importance of this task will be apparent by an inspection of Table I. Not less than 11,261 patients and 390,602 controls have been studied in 14 different countries. An examination of the 27 series listed shows that the only more or less consistent finding is an apparent excess of O and lack of B among the leprosy patients as compared with healthy persons. This possible relation was tested by Woolf's (1955) method. The results are listed in the last two columns of Table I. Despite the fact that the incidence of the disease in O as compared to B persons is greater than 1 in 16, the deviations are not large and in only two Japanese series do they reach the significance level. The combined analysis of all series shows a total relative O:B incidence negligibly different from unity. The χ^2 for heterogeneity among the series is on the borderline of significance ($\chi^2 = 38.3$; 26 d.f.; $p > 0.05$). An analysis was also tried comparing the incidence of the disease among O and non-O individuals. But here again the relative incidence is practically equal to unity (1.02) and the χ^2 for heterogeneity shows a significant value ($\chi^2 = 55.8$; 26 d.f.; $p < 0.001$).

Table II shows results in relation to the Rh system. No clear tendency towards an excess or lack of Rh negatives among patients is apparent from the data. Accordingly, no further analysis was considered necessary.

Table III presents the distribution of ABO phenotypes among the different forms of the disease. There is a tendency for a lack of O and excess of B among the lepromatous patients, but the differences are small, and only in the series from Ghana are they statistically significant. The over-all O:B incidence is 1.15, giving a χ^2 of 2.9 for the difference between this value and unity ($p > 0.05$). The χ^2 for heterogeneity is 12.9 (7 d.f.; $p > 0.05$). Beiguelman (1963, 1964) has found a significant excess of O persons among tuberculoid patients living in São Paulo, Brazil. This difference, however, decreases when his total series is separated into Whites and Negroids. When the incidence of the different forms of the disease in O against all other phenotypes in the series listed here is considered, again the only significant value is given by the Ghana patients. The test for heterogeneity in this analysis is significant at the 2% level if this series is considered. If it is ignored, no significant results are obtained considering all the other series together.

Table IV presents the results of Rh blood typing in patients with different forms of leprosy. As happened with the Rh comparison between leprosy patients and normals, no clear tendency is apparent.

There is no indication, therefore, of any differential susceptibility to leprosy or its forms among the carriers of different ABO and Rh phenotypes. In relation to the ABO system the data are sufficiently numerous to rule out any important contribution of genes in this system to the variance in this attribute. Information concerning other systems is still too scarce and need not be considered here.

This work has been supported in part by the Rockefeller Foundation, Conselho Nacional de Pesquisas and PHS research grant GM-08238, Public Health Service, U.S.A. The help of Dr. M. Kawabe in relation to the Japanese reference materials is gratefully acknowledged.

TABLE I
ABO BLOOD GROUPS AND LEPROSY

Populations Tested	Authors	No. Studied	Phenotypes (%)				Relative Incidence O:B	χ ²
			O	A	B	AB		
<i>Argentina (Buenos Aires)</i>								
Leprosy patients	Puente (1927-28)	233	50.2	36.5	8.1	5.2		
Control	Palazzo and Tenconi (1939)	15,045	44.5	39.5	10.4	5.6	1.4	2.1
<i>Soviet Union</i>								
Leprosy patients	Kolpakov and Andrusson (1928)	130	34.6	38.5	20.0	6.9		
Control	Soboleva and Bazarov (1932)	783	30.1	38.3	22.0	9.6	1.2	0.8
<i>Japan (Okayama)</i>								
Leprosy patients	Omichi (1928)	89	33.7	22.5	34.8	9.0		
Control	Furuhata (1933)	6936	27.7	39.0	23.1	10.2	0.8	0.7
<i>Estonia (Tartu)</i>								
Leprosy patients	Paldrock (1929)	200	33.0	40.5	19.0	7.5		
Control	Rauskas and Poska (1928)	560	38.2	33.3	23.8	4.7	1.1	0.1
<i>Latvia (Riga and Talsen)</i>								
Leprosy patients	Weidemann (1930)	206	34.5	35.9	21.4	8.2		
Control	Weidemann (1930)	1160	32.3	36.6	24.2	6.9	1.2	0.8
<i>Soviet Union</i>								
Leprosy patients	Roudtchenko (1930)	186	24.7	44.1	17.2	14.0		
Control	Soboleva and Bazarov (1932)	783	30.1	38.3	22.0	9.6	1.1	—
<i>Egypt</i>								
Leprosy patients	Ali (1931)	100	18.0	44.0	21.0	17.0		
Control	Shousha (1928)	417	24.2	32.6	29.3	13.9	1.0	—
<i>Madagascar</i>								
Leprosy patients	Hérivaux (1931)	78	30.8	25.6	33.3	10.3		
Control	Hérivaux and Rahoerson (1931)	112	24.1	26.8	25.9	23.2	1.0	—
<i>Japan</i>								
Leprosy patients	Hasegawa (1937)	1426	26.5	39.2	23.8	10.5		
Control	Hasegawa (1937)	301,959	30.5	38.2	21.9	9.4	0.8	8.9
<i>Italy</i>								
Leprosy patients	Cerri (1938)	100	49.0	38.0	10.0	3.0		
Control	Cerri (1938)	181	45.3	39.2	12.2	3.3	1.3	0.4
<i>Java</i>								
Leprosy patients (Blora)	Malaihollo (1940)	46	39.1	32.6	26.1	2.2		
Control	Malaihollo (1940)	79	38.0	26.6	31.6	3.8	1.3	0.2
Leprosy patients (Wates and Poelogad- eng)	Malaihollo (1940)	91	40.6	23.1	33.0	3.3		
Control	Malaihollo (1940)	33	33.3	18.2	45.5	3.0	1.7	1.2
<i>India (Calcutta)</i>								
Leprosy patients	Lowe (1942)	400	30.3	25.5	37.5	6.7		
Control	Lowe (1942)	1638	34.8	22.5	34.8	7.9	0.8	2.4
<i>Spain</i>								
Leprosy patients	Royo Marti (1947)	265	47.2	44.5	7.2	1.1		
Control	Carrión and Hernández (1946)	10,227	44.4	45.7	7.7	2.2	1.1	0.3
<i>Japan</i>								
Leprosy patients	Sato (1949)	469	38.4	39.0	18.3	4.3		
Control	Sato (1949)	28,522	31.5	36.4	22.7	9.4	1.5	9.7
<i>Brazil (Belo Horizonte)</i>								
Leprosy patients	Cesarino Netto (1952)	241	52.7	36.1	8.7	2.5		
Control	Horta de Figueirêdo (1951)	2044	59.9	28.8	8.4	2.9	0.9	0.4
<i>Portugal</i>								
Leprosy patients	Lessa (1954)	600	46.0	44.0	8.0	2.0		
Control	Lessa and Alarcão (1947)	7502	41.8	47.9	7.6	2.7	1.1	0.1
<i>Brazil (São Paulo)</i>								
Leprosy patients (Whites)	Beiguelman (1963)	1947	48.1	38.5	9.8	3.6		
Control	Faria and Ottensooser (1951)	3978	47.8	39.3	10.0	2.9	1.0	0.1
Leprosy patients (Negroids)	Beiguelman (1963)	180	51.7	31.1	12.8	4.4		
Control	Faria and Ottensooser (1951)	277	49.1	28.9	16.6	5.4	1.4	1.2
<i>India (Karigiri)</i>								
Leprosy patients	Hsuen, Thomas, and Jesu- dian (1963)	526	48.9	24.7	23.4	3.0		
Control	Hsuen, Thomas, and Jesu- dian (1963)	1000	39.7	33.1	21.4	5.8	1.1	0.8
<i>Brazil (São Paulo)</i>								
Leprosy patients (Whites)	Beiguelman (1964)	624	46.6	40.4	9.6	3.4		
Control	Faria and Ottensooser (1951)	3978	47.8	39.3	10.0	2.9	1.0	—
Leprosy patients (Negroids)	Beiguelman (1964)	56	58.9	28.6	8.9	3.6		
Control	Faria and Ottensooser (1951)	277	49.1	28.9	16.6	5.4	2.2	2.5
<i>Ghana</i>								
Leprosy patients	Yankah (1965)	400	49.0	21.7	24.8	4.5		
Control	Yankah (1965)	400	51.0	20.7	25.0	3.3	1.0	—
<i>India</i>								
Leprosy patients (Baroda District)	Verma and Dongre (1965)	594	29.8	26.3	38.9	5.0		
Control	Verma and Dongre (1965)	1000	33.5	24.2	34.7	7.6	0.8	3.5
Leprosy patients (Karigiri)	Povey and Horton (1966)	1064	41.4	20.6	33.7	4.3		
Control	Povey and Horton (1966)	755	37.4	21.5	34.4	6.7	1.1	1.2

[Continued overleaf

TABLE I (continued)

Populations Tested	Authors	No. Studied	Phenotypes (%)				Relative Incidence O:B	χ^2
			O	A	B	AB		
<i>Brazil (three cities)</i>								
Leprosy patients (Whites)	Salzano, Suñé, and Ferlauto (1967)	936	46.3	41.4	9.1	3.2		
Control	Salzano, Suñé, and Ferlauto (1967)	572	45.8	42.1	8.6	3.5	1.0	0.1
Leprosy patients (Negroids)	Salzano, Suñé, and Ferlauto (1967)	74	55.4	31.1	13.5	—		
Control	Salzano, Suñé, and Ferlauto (1967)	384	50.3	29.9	16.7	3.1	1.4	0.7

Note: The following papers were not included because: (a) Oguma and Kitamura (1931) based their observations in saliva before the relation between the ABO and secretor genes was fully understood; (b) Miyamura (1930) and Pinetti (1931) studied only 12 and 31 cases, respectively; (c) in the communication by Ri-i-sho and Kamikawa (1931) no information is given about the number of people studied; (d) at the time of writing this paper the articles by Hayashi (1929), Malinin and Strukov (1930), Muneichi (1934), Valle (1937), and Markianos, Karageorgopolou, Mpelezos, and Kouzoutzakoglou (1957) were still not available to me.

When the author did not present a control I have chosen a comparable series studied by a different researcher at about the same time as the leprosy investigation.

TABLE II
Rh BLOOD GROUPS AND LEPROSY

Populations Tested	Authors	No. Studied	Rh (-) (%)
<i>Brazil (Belo Horizonte)</i>			
Leprosy patients	Cesarino Netto (1952)	91	12.1
Control	Memória and Barbosa (1957)	316	10.1
<i>Portugal</i>			
Leprosy patients	Lessa (1957)	600	28.8
Control	„ (1948)	514	14.8
<i>Brazil (São Paulo)</i>			
Leprosy patients (Whites)	Beiguelman (1963)	1859	9.6
Control	Da Silva Lacaz (1951)	3809	15.4
Leprosy patients (Negroids)	Beiguelman (1963)	180	6.7
Control	Faria and Ottensooser (1951)	277	13.0
<i>Ghana</i>			
Leprosy patients	Yankah (1965)	400	6.7
Control	„ „	400	6.3
<i>Brazil (three cities)</i>			
Leprosy patients (Whites)	Salzano et al. (1967)	936	13.9
Control	„ „ „	462	12.8
Leprosy patients (Negroids)	„ „ „	72	5.6
Control	„ „ „	384	8.3

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TABLE III
ABO BLOOD GROUPS AND TYPE OF LEPROSY

Populations Tested and Type of Leprosy	Authors	No. Studied	Phenotypes (%)				Relative Incidence O:B	χ ²
			O	A	B	AB		
<i>India (Karigiri)</i>								
Lepromatous	Hsuen <i>et al.</i> (1963)	258	46.9	24.0	26.4	2.7	1.4	2.2
Non-lepromatous	Hsuen <i>et al.</i> (1963)	268	50.7	25.4	20.5	3.4		
<i>Brazil (São Paulo)</i>								
Lepromatous (Whites)	Beiguelman (1963)	1538	47.3	38.7	10.1	3.9	1.3	1.5
Tuberculoïd (Whites)	Beiguelman (1963)	409	51.3	37.4	8.6	2.7		
Lepromatous (Negroids)	Beiguelman (1963)	118	46.6	35.6	12.7	5.1	1.3	0.3
Tuberculoïd (Negroids)	Beiguelman (1963)	62	61.3	22.6	12.9	3.2		
Lepromatous (Whites)	Beiguelman (1964)	312	43.3	44.9	8.0	3.8	0.8	0.4
Tuberculoïd (Whites)	Beiguelman (1964)	312	50.0	35.9	11.2	2.9		
<i>Ghana</i>								
Lepromatous	Yankah (1965)	196	38.3	27.5	29.6	4.6	2.3	10.7
Tuberculoïd	Yankah (1965)	204	59.3	16.2	20.1	4.4		
<i>India (Baroda District)</i>								
Lepromatous	Verma and Dongre (1965)	288	32.0	25.7	38.5	3.8	0.9	0.7
Non-lepromatous	Verma and Dongre (1965)	306	27.8	26.8	39.2	6.2		
<i>India (Karigiri)</i>								
Lepromatous	Povey and Horton (1966)	382	41.6	19.6	33.8	5.0	1.0	—
Tuberculoïd	Povey and Horton (1966)	431	41.5	20.2	33.7	4.6		
Dimorphous	Povey and Horton (1966)	251	40.6	22.7	33.9	2.8		
<i>Brazil (three cities)</i>								
Lepromatous (Whites)	Salzano <i>et al.</i> (1967)	721	46.5	40.9	9.4	3.2	1.0	—
Tuberculoïd (Whites)	Salzano <i>et al.</i> (1967)	117	43.6	43.6	8.5	4.3		
Indeterminate (Whites)	Salzano <i>et al.</i> (1967)	93	48.4	41.9	7.5	2.2		

Data related to old classifications (those utilized before the Havana International Congress of 1948) were not considered. In the series of Povey and Horton (1966) and Salzano *et al.* (1967) only the results concerning the lepromatous and tuberculoïd types were included in the analysis.

TABLE IV
Rh BLOOD GROUPS AND TYPE OF LEPROSY

Populations Tested and Type of Leprosy	Authors	No. Studied	Rh (-) (%)
<i>Brazil (São Paulo)</i>			
Lepromatous (Whites)	Beiguelman (1963)	1450	9.7
Tuberculoïd (Whites)	" "	409	9.3
Lepromatous (Negroids)	" "	118	5.1
Tuberculoïd (Negroids)	" "	62	9.7
<i>Ghana</i>			
Lepromatous	Yankah (1965)	196	6.6
Tuberculoïd	" "	204	6.9
<i>Brazil (three cities)</i>			
Lepromatous (Whites)	Salzano <i>et al.</i> (1967)	721	14.8
Tuberculoïd (Whites)	" "	117	9.4
Indeterminate (Whites)	" "	93	10.8

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Addendum

A further study has appeared while this paper was in the press: Gupta, M. C., and Gupta, S. R. (1966). Blood groups in relation to pulmonary tuberculosis and leprosy. *Indian J. med Sci.*, **20**, 353.