ABO Blood Groups, Haemoglobin Genotypes, and Loiasis

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The evidence for selection in blood group polymorphism is limited (Reed, 1961); nevertheless, there is increasing interest in research on the association of ABO blood groups, haemoglobin genotypes, and diseases. Williams (1966) found no relation between the ABO blood groups and Burkitt's tumour, but he showed that children over 5 years of age with AA genotype are more susceptible to develop this tumour. Anand (1961) has shown that people with blood groups A and B are more susceptible to eosinophilia, though Anand (1965) found no association between Bancroft's filariasis and the blood groups he studied.

Many blood donors in Ibadan are found to have *Microfilaria loa* in their blood, and this study was undertaken to find out the association, if any, between loiasis, the ABO blood groups, and the haemoglobin genotypes AA, AC, and AS. The author further attempts to relate the microfilarial densities in the blood donors with the distribution of their blood groups and haemoglobin genotypes.

Material and Methods

314 adults with *Microfilaria loa* in their blood were selected for this study. They looked healthy and had blood haemoglobin levels higher than 13 g./100 ml. They were bled during the day, and from each blood donor, two 50 cu. mm. blood films were made for microfilaria count and identification. The blood grouping and the haemoglobin electrophoresis were carried out in the haematology department of the University College Hospital, Ibadan.

The controls for this study were obtained from Gilles (1965) for the ABO blood groups, and G. J. F. Esan and L. Luzzatto (1969, personal communication) for the haemoglobin genotypes AA, AC, and AS.

The microfilaria densities were divided into three groups: (i) those with microfilaria count less than 100; (ii) those between 100 and 500; and (iii) those over 500 in 50 cu. mm. blood. The observed and expected distributions were compared using the conventional χ^2 analysis at the 5% level.

Results

Table I gives the distribution of ABO blood groups in 314 *Loa loa* blood donors compared with the control group. There is no significant difference between the observed and expected distribution.

There is also no significant difference in the distribution of the haemoglobin genotypes AA, AC, and AS when compared with the control group (Table II). The haemoglobin types SC, SS, and CC were not considered in this study because they were not recorded in the donors with loiasis.

TABLE I
DISTRIBUTION OF 314 BLOOD DONORS WITH *MICROFILARIA LOA* BY ABO BLOOD GROUPS COMPARED WITH EXPECTED DISTRIBUTION FROM CONTROL GROUP

Blood Groups	Donors with <i>Microfilaria loa</i>			Control *(26,027)	
	No. Observed	% Observed	No. Expected	No.	%
A	67	21.33	67	5,544	21.3
B	78	24.84	73.1	6,064	23.3
AB	8	2.54	12.2	1,015	3.9
O	161	51.27	161.7	13,404	51.5

$$\chi^2 = 1.74 \quad \text{d.f.} = 3$$

* Gilles (1965).

TABLE II
DISTRIBUTION OF 247 BLOOD DONORS WITH *MICROFILARIA LOA* BY HAEMOGLOBIN GENOTYPES AA, AC, AS, COMPARED WITH EXPECTED DISTRIBUTION FROM CONTROL GROUP

Haemoglobin Genotypes	Donors with <i>Microfilaria loa</i>			Control *(3,000)	
	No. Observed	% Observed	No. Expected	No.	%
AA	167	65	169.6	1980	66
AC	20	7.77	14.9	174	5.8
AS	70	27.23	65.7	768	25.6
SC	—	—	2.1	24	0.8
SS	—	—	4.4	51	1.7
CC	—	—	0.2	3	0.08

$$\chi^2 = 2.08 \quad \text{d.f.} = 2$$

* G. J. F. Esan and L. Luzzatto (1969, personal communication).

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TABLE III
DISTRIBUTION OF 230 ABO BLOOD GROUPS WITH *MICROFILARIA LOA* WITHIN
MICROFILARIAL DENSITY GROUPS COMPARED WITH EXPECTED DISTRIBUTION
FROM CONTROL GROUP*

Microfilaria Count	Blood Groups										χ^2
	A		B		AB		B + AB		O		
	Obs.	Exp.	Obs.	Exp.	Obs.	Exp.	Obs.	Exp.	Obs.	Exp.	
< 100/50 cu.mm. blood	16	18.70	23	20.96	2	2.06	25	23.02	45	44.28	0.56
100-500/50 cu.mm. blood	22	21.97	23	25.68	2	2.47	25	28.15	56	52.88	0.53
> 500/50 cu.mm. blood	11	9.74	6	9.18	—	0.95	6	10.13	24	21.09	2.55

(The figures for A, B + AB, and O blood groups were used to calculate the χ^2)

* Gilles (1965).

d.f. = 2

Though the observed figures for AC and AS are slightly high, the differences are probably due to the smallness of the sample.

The observed and expected data for the AB blood group within the microfilaria density groups are below the critical value of 5; hence it was decided to combine AB and B blood groups in Table III in order to avoid introducing large errors in the χ^2 test. There is, however, no significant difference in the ABO distribution within the microfilarial density groups when compared with that expected from the control.

The number of donors with haemoglobin genotype AC is small, and when these are arranged according to the microfilarial density groups (Table IV) the figures obtained are too low for analysis.

However, no evidence of a significant difference is shown when the observed haemoglobin genotype distribution within the microfilarial density groups is compared with that expected from the control.

Discussion

Our present knowledge of the pathology of

loiasis is inadequate and the parts played by both the microfilarial and the adult *Loa loa* need thorough investigation. Anand (1965) found that the ABO blood groups were not associated with filariasis, though he studied patients with *Wuchereria bancrofti*.

Anand (1961) had found an association between eosinophilia and blood groups A and B. Since eosinophilia cannot be regarded as a disease entity, but rather as a sign that may be associated with a large variety of diseases, the author has decided to test specifically for one of the conditions that is a common cause of eosinophilia in Nigeria, namely, loiasis. In this study there was no preferential infection by *Loa loa* of any of the groups of subjects studied, whether classified according to the ABO antigens or to their haemoglobin type (Tables I and II). It was conceivable that a protective effect in one of the groups might be exerted not in terms of preventing infestation, but in terms of parasite density. However, even when the affected individuals were classified on the basis of the degree of their infestation, no statistically significant difference was found among any of the groups analysed (Tables III and IV). It must, therefore, be concluded that there is no evidence that any of them is at either an advantage or a disadvantage with respect to infestation by the *Loa loa* type of filaria. This means that if the difference found in India (Anand, 1961) in the rate of eosinophilia between subjects with group A and B compared with subjects with group O were confirmed in Nigeria, the explanation would probably lie in conditions other than filariasis.

The control groups (Gilles, 1965; Esan and Luzzatto, 1969, personal communication) were Yoruba adults; and the blood donors studied were adults living in Ibadan, a city that draws most of its inhabitants from the neighbouring Yoruba towns and villages. Consequently, the controls were found suitable and valid for the comparisons made.

TABLE IV
DISTRIBUTION OF 239 HAEMOGLOBIN GENOTYPES
WITH *MICROFILARIA LOA* WITHIN MICROFILARIAL
DENSITY GROUPS COMPARED WITH EXPECTED
DISTRIBUTION FROM CONTROL GROUP*

Microfilaria Count	Haemoglobin Genotypes					
	AA		AC		AS	
	Obs.	Exp.	Obs.	Exp.	Obs.	Exp.
< 100/50 cu.mm. blood	52	55.44	5	4.87	27	21
100-500/50 cu.mm. blood	71	70.62	10	6.11	26	26.75
> 500/50 cu.mm. blood	29	31.68	4	2.88	15	12.5

(There is no evidence of a significant difference between the genotype distribution and the microfilarial density groups.)

* G. J. F. Esan and L. Luzzatto (1969, personal communication).

Summary

Studies were made of 314 adults with loiasis to see if there was a possible relation between the ABO blood groups, haemoglobin genotypes, and loiasis. There was no preferential infection by *Loa loa* of any of the groups of subjects studied, whether classified according to their ABO antigens or to their haemoglobin type. There was also no protective effect exerted on any of the groups in terms of microfilaria density.

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