

THE BLOOD GROUPS OF THE PEOPLE OF EGYPT

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By means of its land connection with Asia, Egypt is one of the gateways through which large movements of people into and out of Africa have taken place. Physical anthropologists nevertheless point to a general persistence of physical type in Egypt throughout many thousands of years. A comparison of the blood groups of the people of Egypt with those of their neighbours must therefore be of great interest. Numerous studies of their ABO and MN groups, summarised by Boyd (1939), had already been made but nothing was known of their Rh groups.

TABLE 1

The A₁A₂BO groups of 144 Egyptians

Group	Moslems	Christians	Total observed	Number expected	Frequency observed
O	23	16	39	42.1	0.271
A ₁	16	28	44	42.2	0.306
A ₂	4	1	5	4.4	0.035
B	27	17	44	40.1	0.306
A ₁ B	4	7	11	13.4	0.076
A ₂ B	0	1	1	1.7	0.007
Total	74	70	144	143.9	1.001

Gene frequencies

O	.	.	.	.	.	0.541
A ₁	.	.	.	.	.	0.217
A ₂	.	.	.	.	.	0.027
B	.	.	.	.	.	0.215
						1.000

It is well known that the present population of Egypt is markedly heterogeneous. The educated classes in particular have received recent accessions from various other countries, especially around the eastern Mediterranean; in the opinion of some anthropologists one of the oldest established elements in the population, and one bearing a close resemblance in physical characters to the ancient Egyptians of Pharaonic times, consists of those people in Upper Egypt who,

TABLE 2
The MNS groups of 144 Egyptians

Group	Moslems	Christians	Total observed	Number expected	Frequency observed
MS	11	16	27	25.7	0.187
Ms	4	8	12	12.4	0.083
MNS	20	17	37	36.6	0.257
MNs	16	17	33	35.3	0.229
NS	6	3	9	8.8	0.062
Ns	17	9	26	25.3	0.181
Total	74	70	144	144.1	0.999

Chromosome frequencies

MS	0.221	} 0.514
Ms	.	.	.	.	0.293
NS	.	.	.	.	0.067
Ns	.	.	.	.	0.419
Total	<u>1.000</u>	

TABLE 3
The Rh groups of 184 Egyptians

Phenotype	Commonest genotype	Number observed	Number expected	Frequency observed
CCDee *	CDe/CDe	47	45.0	0.255
CcDee	CDe/cde	73	75.7	0.397
CcDEe	CDe/cDE	15	16.3	0.081
ccDEE	cDE/cDE	1	1.5	0.005
ccDEe	cDE/cde	16	13.7	0.087
ccDee	cDe/cde	20	19.9	0.109
ccD ^u ee	cD ^u e/cde	1.09 †	1.1	0.006
ccdde	cde/cde	10.91 †	10.8	0.059
Totals	.	184	184.0	0.999

* See Mourant (1949).

† Out of 12 samples found on preliminary testing to be cde/cde, 11 were further tested for the presence of the D^u antigen which was found in one of them. The remaining one had been tested before the test for D^u had become standard practice. It has therefore been partitioned between the two phenotypes in the proportion of 10 : 1.

Chromosome frequencies

CDe *	.	.	.	.	0.495
cDE	.	.	.	.	0.090
cDe	.	.	.	.	0.161
cD ^u e	.	.	.	.	0.012
cde	.	.	.	.	0.243
Total	.	.	.	.	<u>1.001</u>

* The anti-C serum used had the specificity anti-C+anti-C^w. CDe therefore includes any C^wDe which may have been present in the population.

at the present time, practise the rites of the Coptic Christian Church. The heterogeneity of modern Egyptians is reflected in the variations in the frequencies of the ABO blood groups.

Whilst we should have preferred to confine our studies to one or more groups of people selected on anthropological grounds we have hitherto been unable to obtain sufficient suitable specimens for this purpose : and the results obtained by examining specimens obtained through a variety of channels and selected in different ways show, nevertheless, sufficient homogeneity from the blood group point of view and at the same time are of such great interest and show such a great difference from all other populations so far examined, as to make it desirable to publish this account at once rather than to delay in order to add to our data. We hope that we ourselves and other workers will later be able to supplement these by many more tests.

In 1947 Dr R. R. Race determined the ABO and Rh groups of 20 Moslems and 20 Coptic Christians of Egypt, from specimens of blood kindly sent through the courtesy of Brigadier H. T. Findlay. Dr Race has kindly allowed us to use these results. Subsequently one of us (K. A. I.) was able to collect specimens from a considerable number of Egyptians resident in London. Then we received from Professor J. H. Fisher two consignments of specimens obtained from Coptic Christians of Upper Egyptian origin. These were specially selected from the anthropological point of view and as far as could be ascertained by careful questioning, none of the subjects had any known ancestors born outside Egypt. The numbers of them are too small at present for separate statistical treatment, but to enable them to be used in any future study in combination with results obtained from other people selected in a similar manner, their full blood groups are listed in table 4. The remaining Christians tested are probably comparable but we have no guarantee of this other than the similarity of their blood-group frequencies.

A small number of the Moslems are known to have had some non-Egyptian ancestors, but an attempt to eliminate such persons from our lists would have been very difficult and liable to lead to errors due to bias arising from the known results of the tests, errors possibly greater than have been introduced by their retention. We thus had available altogether the results of testing 184 persons, 94 Moslems and 90 Christians. All of these were tested for Rh (with anti-C+anti-C^w, anti-D, anti-E, anti-c and anti-e). In the first 40 tests carried out by Dr Race no distinction was possible, owing to the age of the specimens, between A₁ and A₂; since the total frequencies of the groups O, A, B, and AB among these 40 differed little from those found in the subsequent 144, the former have been disregarded in our ABO calculations. The first 40 were also not tested for MN and S. Among all but the same 40, apparent D-negatives were subjected to an indirect Coombs test with a strong incomplete anti-D serum in order to detect the D^u antigen if present.

From our results we have calculated gene frequencies by methods already used by some of us (Chalmers, Ikin and Mourant, 1949; Prasad, Ikin and Mourant, 1949) and from these the expected phenotype numbers have been calculated and compared with the observed values. The Rh calculations are, however, somewhat complicated by the fact that the group ccee here includes three phenotypes, ccDee, ccD^eee and ccddee. The chromosome frequencies cDe, cD^ee and cde were therefore calculated from the frequencies of these phenotypes and a proportional correction made so that the sum of

TABLE 4

Sixty-two anthropologically selected Copts of Upper Egyptian ancestry classified according to A₁A₂BO and MNS groups and probable Rh genotypes

Probable Rh genotype	AB	A ₁	B	O
CDe/CDe	Ms 1 MNS 1* MN _s 1	Ms 1 MNS 2 MN _s 1 Ns 1	MS 1 MNS 1 MN _s 2	MS 1 MNS 1 MN _s 1
CDe/cDE	...	MNS 1 MN _s 2	...	...
CDe/cde	MS 1 MN _s 1	MS 2 Ms 3 MNS 3 MN _s 3	MS 1 Ms 3 MNS 1 MN _s 1	MNS 2 NS 2 Ns 1
cDE/cde	MNS 1	...	MS 1 MN _s 1 Ns 1	MS 2 MN _s 1
cDe/cde	Ns 1	MS 2 Ns 1	Ns 1	MS 1 MNS 1 MN _s 1
cD ^e e/cde	...	...	MN _s 1	...
cde/cde	...	Ns 2	MNS 1	MS 1

* All the persons classified as AB were A₁B with the exception of this one who was A₂B.

the chromosome frequencies should agree with the total frequency of ce chromosomes found by the methods described by Chalmers, Ikin and Mourant (1949). These methods are adopted as expeditious though known not to be fully efficient.

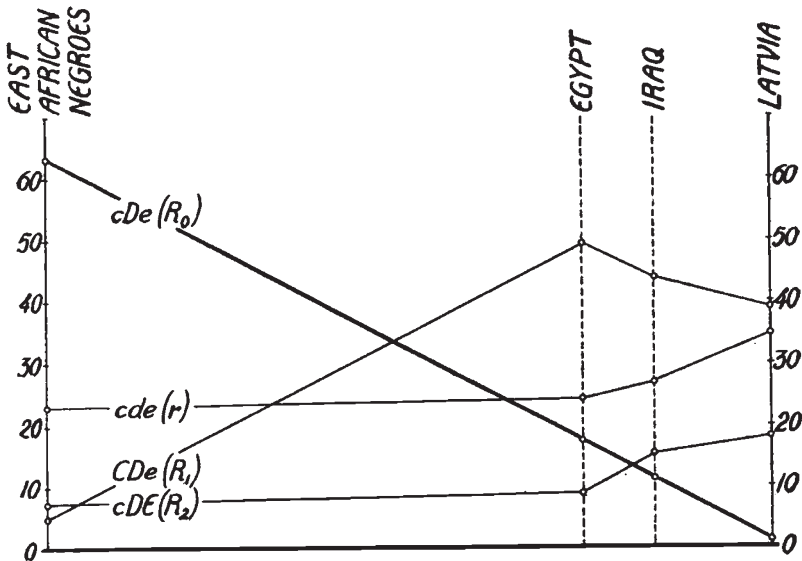
We have shown in tables 1 and 2 separate totals of Christians and Moslems but have based all our calculations on the totals of both. The differences in Rh phenotype frequencies are not given because they were (table 3) well below the level of significance. Even in the case of ABO and MN, where they are greater, they are still not significant.

We do not propose in this paper to undertake a critical study of

the ABO and MN groups of the population of Egypt. Among the wide range of frequencies found by different observers and quoted by Boyd (1939) it is difficult to select the most reliable but it is clear that our results do not differ greatly from those of most previous workers. As a rough estimate the average percentage gene frequencies found by others among Christians are A, 25 ; B, 21 ; O, 54 ; and

Rh CHROMOSOME FREQUENCIES (PER CENT) IN EAST AFRICA, WESTERN ASIA AND EASTERN EUROPE.

Based on the present study, on the work of Kayssi (1949), Race, Sanger, Lawler and Keetch (1948), and on unpublished data of Ikin and Mourant.



The diagram shows the fall in frequency of the cDe chromosome from south to north, the maximum frequency of CDe in Egypt, and the corresponding variations in frequency of the other common Rh chromosomes. The spacing on the horizontal scale is arbitrarily arranged so as to make the frequencies of cDe fall on a straight line.

FIG. 1.

among Moslems A, 28 ; B, 21 ; O, 51 ; whereas our overall figures show A, 24 ; B, 21 ; O, 54, with, in fact, a higher frequency of A among Christians than among Moslems. We have found the ratio of the phenotype frequencies A_2/A_1 , to be 0.11 which is lower than the values (0.17 to 0.24) found by previous workers and quoted by Boyd (1939). From Boyd's compilation of MN data the gene percentages for both Moslems and Christians are roughly M, 53 ;

N, 47 whereas we find M, 51 ; N, 49. Our determinations of the Ss subgroups of the MN system are the first to be published for Egyptians.

In their Rh phenotype frequencies the Egyptians differ very greatly from all other populations yet examined except the people of Baghdad (Kayssi, 1949) to whom they show a moderate degree of resemblance. The outstanding feature of the Egyptians is their very high CDe(R_1) frequency, considerably higher than that of any population in Europe for which figures have been published, and very much higher than some of us have found in testing numerous other African populations (Donegani, Ikin and Mourant, unpublished). At the same time they show a higher cDe(R_0) frequency than any non-Negro population nearer than Eastern Asia. While any final conclusion must depend on the examination of many other Near Eastern populations, an examination of fig. 1 in which the Rh chromosome frequencies of East Africans, Egyptians, Iraqui and Europeans (Latvians) are compared suggests the following tentative conclusions :

(i) The Egyptians represent a basic or culminating population type with a small Negro admixture. (ii) In Iraq we find the Egyptian type, still with a certain Negro admixture, considerably diluted with European stock ; indeed, in view of recent observations on the Rh groups of Indians (Prasad, Ikin and Mourant, 1949) we can probably say that the dilution was with Indo-European stock.

SUMMARY

The A_1A_2BO and MNS blood groups of 144 Egyptians, and the full Rh phenotypes of 184 Egyptians have been determined. The Egyptians show a high frequency (21 per cent.) of the B gene. Their MN distribution does not differ significantly from that found in Europe and in other parts of Africa. Their Rh distribution is different from any other yet discovered, with a high frequency of CDe or R_1 (49 per cent.) which is probably an ancient Egyptian characteristic, and with 16 per cent. of cDe(R_0) chromosomes, a feature probably derived from an admixture of Negro stock.

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REFERENCES

- BOYD, W. C. 1939. *Tab. Biol.*, 17.
 CHALMERS, J. N. M., IKIN, ELIZABETH W., AND MOURANT, A. E. 1949. *Am. J. Phys. Anthropol.*, N.S., 7, 529-544.
 KAYSSI, A. I. 1949. *Am. J. Phys. Anthropol.*, N.S., 7, 549-551.
 MOURANT, A. E. 1949. *Nature*, 163, 913.
 PRASAD, C. H., IKIN, ELIZABETH W., AND MOURANT, A. E. 1949. *Am. J. Phys. Anthropol.*, N.S., 7, 553-558.
 RACE, R. R., SANGER, RUTH, LAWLER, SYLVIA D., AND KEETCH, D. V. 1948. *Ann. Eugen.*, 14, 134.