A BIOSEROLOGICAL CONSIDERATION OF THE MIGRATION OF THE THAI RACE

A Preliminary Report of a New Concept.

by

Somsak Phansomboon, M.D., M.S., Ph. D.

The work on blood groups of the Thai which is presented here had its start in the year 1947. At that time, anyone who attempted to do research in pure medical science in Thailand was looked upon askance. Many of my revered teachers scoffed and said that I would never become rich by doing so, and, curiously enough, after ten years of research work, I have found that their advice is all too true.

Although the blood group distributions had been extensively investigated in Caucasians, there was little information about the distribution of them in non-Caucasians, especially in the Thai. It was therefore extremely worthwhile to work out the percentages of gene frequencies in the Thai people. I have carried out such a study, based on blood group serology and mathematics, of the ABO, Rh, MNS, Kell, Lewis and Duffy blood types of the Thai. This study has cast some light on the migration pathways of the Thai stock.

Four hundred and twenty-one blood samples were collected at random, mostly from patients in Siriraj Hospital. The red blood corpuscles of each sample were washed twice with physiological saline made into two-percent suspension. Thirteen antisera were employed, namely, anti-A, anti-B, anti-M, anti-N, anti-S, anti-C, anti-E, anti-c, anti-e, anti-Le^a, anti-K, anti-k, and anti-Fy^a. An equal volume of two-percent suspension of red blood corpuscles and anti-serum was mixed in a small test tube and incubated at 37°C for one hour, with the exception of anti-Le^a serum, which

1. Based upon a lecture delivered at the June 27, 1957, meeting of the Siam Society.

Table I

The ABO Blood Groups

	Phenotype Observed	Frequencies % Expected	Gene frequencies %
A	17.84	19.86	14.84
B	35.21	37.11	25.66
O	37.09	35.40	59.50
AB	9.86	7.63	–

Table II

The Rh Blood Groups

	Phenotype Observed	Frequencies % Expected	Chromosome frequencies %
CDe/CDe (Rh_1Rh_1)	56.34	57.06	
CDe/cDe (Rh_1Rh_o)	18.31	16.81	
CDe/cDE (Rh_1Rh_2) cDe/CDE (Rh_oRh_z)	16.43	17.36	
CDe/CDE (Rh_1Rh_z)	3.29	3.26	
cDE/cDE (Rh_2Rh_2)	1.88	1.25	
cDE/cDe (Rh_2Rh_o)	1.88	2.49	
cDE/CDE (Rh_2Rh_z)	1.41	0.48	
cDe/cDe (Rh_oRh_o)	0.47	1.24	
CDE/CDE (Rh_zRh_z)	0.00	0.05	
CDe (R_1)	–	–	75.54
cDE (R_2)	–	–	11.17
cDe (R_o)	–	–	11.13
CDE (R_z)	–	–	2.16
cde (r)	–	–	0.0

Table III

The MNS Blood Groups

	Phenotype Frequencies % Observed	Expected	Gene or Chromosome frequencies %
MMS	3.85	4.05	
MsMs	37.98	36.82	
MNs	44.33	4.69	
MsNs	39.90	41.43	
NNs	1.92	1.35	
NsNs	12.02	11.66	
MS	–	–	3.25
Ms	–	–	60.68
NS	–	–	1.93
Ns	–	–	34.14
M	–	–	63.95
N	–	–	36.05
S	–	–	5.18
s	–	–	94.82

Table IV

The Duffy, Kell and Lewis Blood Groups

Systems	Phenotype frequencies %		Gene frequencies %	
Duffy	Fy (a+)	97.12	Fy^a	83.01
	Fy (a-)	2.88	Fy^b	16.99
Lewis	Le (a+)	18.27	Le^a	42.74
	Le (a-)	81.73 other alleles		57.26
Kell	No Kell positive		K	0.0
			k	100.00

was incubated at room temperature. Coombs' anti-globulin serum[2] was also applied in some of the tests, such as the ones on the anti-K and anti-Fy^a sera. They were then centrifuged at slow speed for a few minutes, and the reactions read under the low power of the microscope.

The percentages of phenotype, of gene or chromosome frequencies in all of these blood groups are summarized in tables I, II, III and IV. [3,4]

The Thai race has a very high B frequency, which is characteristic of southeastern and central Asians. The Thai people also possess a rather high M frequency, which agrees well with that of the population of the Malay Archipelago. These findings are quite in contrast to with B and M frequencies of the Caucasians, who inherited approximately nine percent of B antigen and twenty-eight percent of M antigen.

Before going any further, it may be worthwhile to attempt a definition of the term, "race." The layman will speak of the "white race," "African race," or "Chinese race," simply because the people referred to differ in language, complexion and stature. Modern anthropologists will argue that race is not a matter of skin pigmentation, of religion or of language. Hooton5 considers that the proper criteria of race are the physical characteristics and he has offered his own definition of race... "A race is a great division of mankind, the members of which, though indirectly varying, are characterized as a group by a certain combination of morphological and metrical features, principally non-adaptive, which have been

2. Coombs, R.R.A., Mourant, A.E., and Race, R.R., "A new test for the detection of weak and incomplete RH agglutinins," *Brit. J. Exp. Path.*, 26, 255-266, 1945.

3. Phansomboon, S., Ikin, E.W., and Mourant, A.E., "The ABO, PH and M.N. Blood Groups of the Siamese (Thais)," *Am. J. Phys. Anthrop.*, 7, 563-5o5, 1949.

4. Phansomboon, S., "The MNS, Kell, Lewis and Duffy Blood Groups of the Thais," *Vox Sanguinis*, 1, 39-42, 1956.

5. Hooton, E.A., *Up from the Ape* (New York: Macmillan Co., 1946).

derived from their common descent." Non-adaptive characteristics are those which are not subject to the action of natural selection; this seldom occurs in nature.

Huxley and Haddon[6] have questioned the above statement by arguing that it is almost impossible to prove that the population in an area in question has a common descent, unless we have historical or paleontological or other scientific evidences of it. Climatic environmental conditions are constantly changing, thus forming a new era for certain species, and only certain types of combinations would be able to spread into these new areas; adaptive types might come from more than one source. Finally, these will constitute a single geographical and genetical species which would not necessarily have a single common descent. The assumption that a group of people who look alike constitute a distinct race derived from a common origin is, therefore, not justified.

The definition of Coon[7] that "race" is a group of people who possess the majority of the same physical characteristics falls into the same category. That the word "race" is very difficult to define is admitted by Kluckhohn[8] who has stated that the term, scientifically speaking, hardly serves a useful purpose.

Dobzhansky[9] has criticized the measurement methods that, although they are simple and undeniably convenient for a rough description of the observed variety of humans or of other living beings, nevertheless lead to a hopeless confusion when an analysis of the underlying causes of this variety is attempted. He stated that a geneticist can define "race" by indicating populations that differ from each other by certain genes. He has also remarked that the naive concept of "pure race" must be replaced by the authentic one of varying incidence of definite genes.

---

6. Huxley, J.S. and Haddon, A.C., *We Europeans* (London: J. Cape, 1935).

7. Coon, C.S., *The Races of Europe* (New York: Macmillan Co., 1939).

8. Kluckhohn C., *The Science of Man in the World Crisis* (New York: R. Linton, Columbia Univ. Press, 1945).

9. Dobzhansky, T., *The Genetics and the Origin of Species* (New York: Columbia Univ. Press, 1941).

Some modern anthropologists, well aware that the old methods of sorting out the characteristics of the originally pure racial components are doomed to failure, have sought for another, more scientific approach to study the descent of mankind. They have turned back to Mendel's principles of independent assortment of chromosomes in inheritance and the possibility of the crossing over of genes between pairs of chromosomes, and their findings have revealed, with sufficient accuracy, the remote ancestral types of a modern population.

At the present time, it is generally accepted that the anthropological classification of mankind based upon known genetic characteristics is the most reasonable, if not the best, of all other measures. The question naturally arises: which genetically determined characteristics can be conveniently and scientifically used as a basis of physical classification?

Boyd[10] has divided the inherited characteristics into three categories:

I. Characteristics which are fairly common and variable, believed to be inherited although the mechanism is still unknown; included in this category are the body height, shape of face and nose, cranial size, colour of skin and hair, etc.

II. Rare pathological conditions of which the mechanism of inheritance is known. Examples in this group are hemophilia, favism, colour blindness, baldness, inborn errors of metabolism such as cystinuria, etc.

III. Normal physiological characteristics inherited by a known genetical mechanism.

Only the third group seems to meet the requirements. Two of the simplest and most important in this class are the blood groups and the abnormal hemoglobins; the author shall make the latter the subject of another article. The blood groups have several advantages over other methods, namely:

10. Boyd, W.C., *Genetics and the Races of Man* (Boston: Little, Brown & Co., 1950).

1. They are known to be inherited according to Mendelian principles.
2. They are not affected by disease or environment.
3. Their frequencies in a population are stable characteristics.
4. They are believed to occur very early in the course of man's evolution.
5. There is a correlation between the geographical distributions and those of the blood groups.
6. They are distinctly distinguishable inherited characteristics which do not grade into each other.
7. There are no prejudices against genes of the blood groups, as there have been and still are against physical characteristics, such as skin colour.

It is true, as Simpson[11] has asserted, that from the morphological viewpoint, genetics can never replace the study of fossil remains, but it can contribute much to a better understanding and a more adequate concept of that study.

It has been known that the agglutinogens of human red blood cells so far discovered are not restricted to any special race, and therefore the presence or absence of any of the agglutinogens in a given blood sample does not signify that this blood belongs to an individual of a given race. However, if the agglutinogens of any blood factor of different populations are studied in comparatively large numbers, it will be seen that the gene frequency distributions do vary in different races.

Hirszfeld and Hirszfeld[12] were the first to study successfully the racial distributions of the ABO blood group during World

11. Simpson, G.G., *Tempo and Mode in Evolution* (New York: Columbia Univ. Press, 1944).

12. Hirszfeld L. and Hirszfeld, H., "Serological Differences between the Blood of Different Races. The Result of researches on the Macedonian Front," *Lancet*, 2, 675-679, 1919.

War I. Since then, there have been reliable and sufficient data on the ABO system to show that factor A first appeared in Europe and gradually spread eastwards; similarly, factor B had its origin in Asia and spread in the opposite direction.

With the introduction of the MNS, Rh, Kell, Lewis and Duffy blood factors, the racial distributions could be studied in more detail. The individuals I have tested were one-hundred-percent Rh positive; the Rh negative chromosome (cde or r) is, therefore, assumed to be absent in the Thai people.

The frequency of S positive is low, which is generally true in southeast Asian peoples, whereas the Duffy positive has a very high distribution in the Thai, numbering 97.1 percent. The frequency of Le (a+) falls within the narrow range (18.3 percent) which is characteristic of most people, with the exception of the American Indians.

There is no Kell positive (K+) in this series, and thus the Cellano (k) factor is presumed to be one hundred percent.

For comparison, the gene or chromosome frequencies of the ABO, MN, Rh and Duffy blood groups among the Thai, Indonesians and Chinese are represented in Table V. The Cantonese are chosen for this purpose because their inhabitants are nearest to Thailand. The figures are taken from the tables compiled by Mourant[13] and Wiener.[14]

It will be seen that the gene frequency percentages of these blood factors of the Thai closely resemble those of the Indonesians, and particularly those of the Javanese. The author deplores his inability here to mention Burma and Indochina, the two very close neighbors of Thailand. This is due to the fact that studies of the

13. Mourant, A.E., *The Distribution of the Human Blood Groups* (Oxford; Blackwell Scient. Public., 1954).

14. Wiener, A.S., *Blood Groups and Transfusion* (Springfield, Illinois: C.C. Thomas, 1948).

blood group frequencies of the latter country, with the exception of the ABO distributions furnished by Farinaud,[15] are reltively scanty, so that any attempt to delineate the descent of the Indochinese will be liable to error. This also applies to the Burmese.

My investigation of the ABO, MNS, RL, Lewis, Kell and Duffy blood groups in the Thai people have led me to conclude that they migrated from the south, rather than from the north, to their present home. This of course remains an hypothesis. But it is a most interesting one and I have ventured to expand it, within the limits of scientific caution.

I would submit that two or three thousand years ago, the stocks of the people who were the ancestors of the present-day Thai left Indonesia, or more specifically Java, and migrated northward. They moved, probably in more than one wave, and settled down in the regions that are now Malaya and Southern Thailand, possibly as far north as Nakorn Pathom. Their population increased so rapidly that some of them migrated still farther north until they established the Kingdom of Nan Chow. For many decades this Kingdom and the Chinese made military forays against each other. In the end the Thai were overwhelmed and defeated. They withdrew to the south, consolidated their populations, and founded the Kingdom that is now Thailand.

Further study of the blood groups of the Thai should make possible the formation of a more complete hypothesis on the migrations of the race to its present home. I hope that I shall be able to present such an hypothesis after I have made this study.

15. Farinaud, E., "Contribution a l'etude des populations de l'Indochine meridionale francais d'après la repartition des groupes sanguins" *Bull. Soc. Anthropl.* Paris, 2, 75-102, 1914.

Table V

Comparison of the gene frequency distributions of various blood groups in three populations

System	Gene or chromosome frequency % Thai	Indonesian (Javanese)	Chinese (Cantonese)
ABO			
r ($\bar{O}$)	59.50	59.40	67.40
p ($\bar{A}$)	14.84	15.50	16.00
q ($\bar{B}$)	25.66	24.80	17.40
MN			
M	66.20	63.17	61.39
N	33.80	36.83	38.61
		(mixed)	
Rh			
CDE (R^z)	2.17	3.01	0.0
CDe (R^1)	75.53	78.49	17.36
CdE (r^y)	0.0	0.0	0.0
Cde (R')	0.0	0.0	0.0
cDE (R^2)	11.16	10.97	18.15
cdE (R'')	0.0	0.0	0.0
cDe (R^o)	11.14	7.53	3.07
cde (r)	0.0	0.0	7.42
Duffy			(New York)
Fy^a	83.01	figures not	90.15
Ey^b	16.99	available	9.85