

divided in about 8000 municipalities (comuni), 92 provinces, and 19 regions, it was necessary to merge several adjacent municipalities into larger areas included in the same province. Homogeneity tests were performed on ABO phenotypic frequencies between areas within provinces, as well as between provinces within regions. According to the results of these tests it was decided at which level the gene frequencies should be computed. Such frequencies were estimated according to *Bernstein's* method and for every set of estimates a goodness of fit χ^2 was computed. The observed χ^2 distribution conforms very closely to the theoretical distribution when computed on a birth place basis, but not when they are computed on residence areas. It was then decided to make use only of the birth places to examine the geographical distribution of blood group gene frequencies.

The results of the investigation point out that ABO gene frequencies differ considerably in Northern Italy as compared to Southern Italy. Gene A occurs more frequently in the northern part of the country, showing a maximum value of 0.28 in some provinces, and decreasing progressively to reach its minimum value at Reggio Calabria (0.17). Gene B frequency, on the other hand, increases from 0.05 in some northern provinces to 0.12 at Potenza.

An analysis has been also carried out on the Rh (D_{\pm}) records of the same blood donors. Rh phenotypic frequency showed an increasing trend from south to north, but accurate statistical tests were not performed since their reliability seemed to be impaired by inconsistencies in typing techniques between transfusion centers.

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Distribution of ABO and Rh (D) Blood Groups in the Netherlands

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Every Dutchman when he reaches the age of 17, has his blood group determined by the Military Blood Transfusion Service for ABO groups and in the last few years also for the Rh D factor.

For 5 years the results of all these determinations were tabulated according to birth-places. The total material collected in this way for statistical analysis amounts to almost 350,000 ABO- and more than 130,000 Rhesus-D determinations.

Blood grouping is done with the greatest accuracy. Extensive control tests have shown that the percentage of mistakes must be extremely low: even less than $\frac{1}{10000}$.

Extensive statistical analysis is still in progress. A preliminary report of the first results will be presented here.

For purposes of analysis, the statistical material was divided into 2 groups: the country, with the small towns and villages with less than 20,000 inhabitants, and the town municipalities of more than 20,000 inhabitants.

The first group includes 193,000 ABO and 71,000 Rh determinations, the second group 155,000 ABO and 60,000 Rh determinations.

The material of the country-group was sub-divided into 100 small districts of 5 to 20 municipalities each. Two adjoining districts were compared by the χ^2 test. If the differences between the two districts were not significant, they were joined and tested against the next district, etc. In this way, the original number of 100 districts was reduced to 27. Gene frequencies were calculated in these 27 districts and in the 42 towns with more than 20,000 inhabitants*.

It appears that low O-frequencies apart from the neighbourhood of the big cities Amsterdam and Rotterdam, are almost exclusively found in the south and south-east of the country. The highest O-frequencies occur in the north and north-east. The frequencies in which the A-gene occurs tend to be the opposite of those of the O-gene.

The lowest A-frequencies are found in the north and east of the country and on the islands of Zeeland in the south-west. Furthermore, there are a few regions with very little A in the west. High A-frequencies are found especially in the south-east and also in a few larger towns and in the area around Amsterdam (fig. 1).

The B-frequencies show less regularity. High frequencies are found especially around the southern part of the former Zuiderzee and in the south-west of the

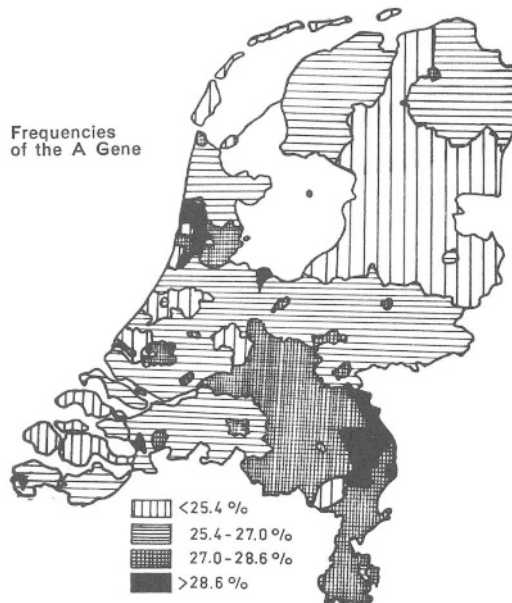


Fig. 1

* The figures of ABO frequencies in these 27 districts and 42 towns have been presented in detail in a book by A. E. Mourant; A. C. Kopec and K. Domaniewska-Sobczak: The ABO blood groups, comprehensive tables and maps of world distribution (Blackwell, Oxford 1958).

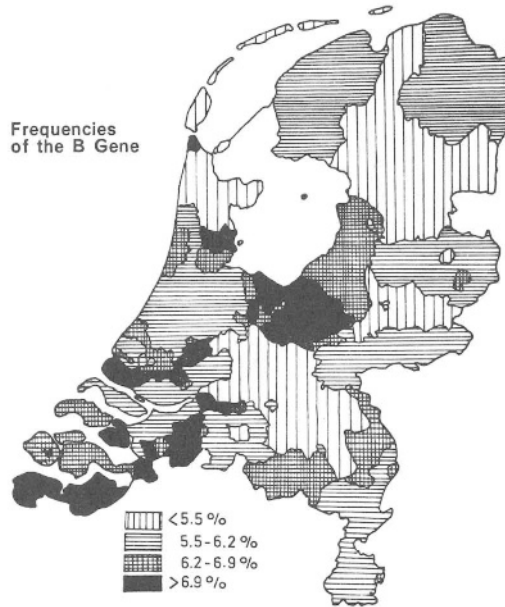


Fig. 2

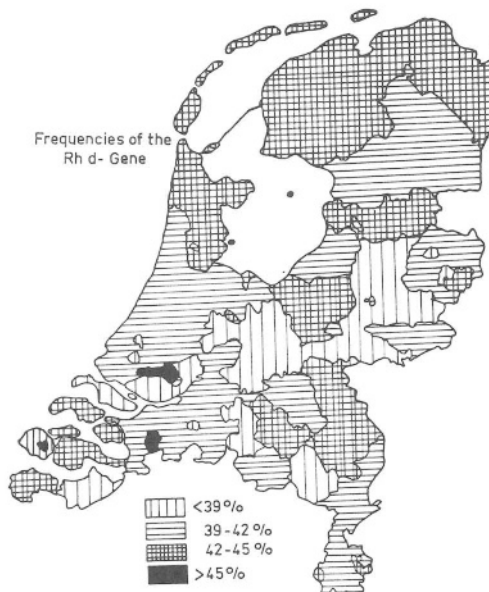


Fig. 3

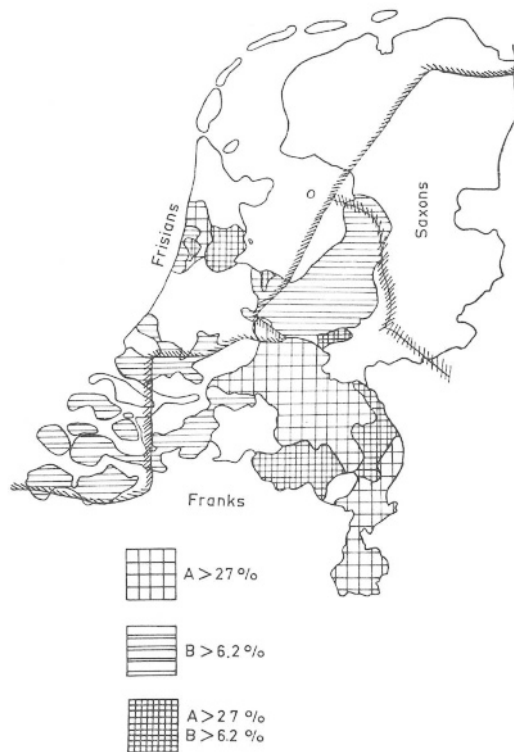


Fig. 4

country. Lowest B-frequencies occur in the north and the east and in a large part of the south, that covers a part of the area of high A-frequencies (fig. 2).

The next figure shows the frequencies of d-gene of the Rh-system. The distribution is fairly irregular. The north has high frequencies of Rh negatives just as the greater part of Zeeland and a few scattered regions in the east. It seems as if in the centre of the country a long and narrow region with few Rh-negatives stretches from east to south-west (fig. 3).

Is it possible to interpret this distribution of blood groups in relation to an anthropological or historical background? If we want to know the components of a population, we have to consider what migrations have occurred in the earliest history.

At the beginning of the Christian era, the Netherlands were inhabited by several Teutonic tribes. The Romans settled in several places in the south and the centre of the country and thus imported Mediterranean elements. After the great migration of the nations in Europe at the beginning of the Middle Ages, the Netherlands seem to have been inhabited by 3 peoples: the Frisians, the Saxons and the Franks.

The Frisians were an autochthonous tribe in the north that has extended its power all over the western part of the country. The Saxons were a combination of several other autochthonous tribes, while the Franks invaded the country from the south. They originated from the Upper Rhine Lowland and presumably on their way through France and Belgium have absorbed various southern elements.

It can hardly be assumed that each of these three peoples have formed a homogeneous entity. The Frisians who originally covered a much smaller territory most probably have absorbed various small tribes while extending their area.

This applies to the Franks as well. Moreover, in the course of centuries intermixture will have occurred individually and by migration in groups.

On trying to establish the existence of a correlation between Frisian, Frankish or Saxon descent and bloodgroup frequencies, we find the following picture (fig. 4).

It appears that almost everywhere in the Frankish territory high A-, high B-frequencies or both occur. This was to be expected, for the Franks originated from the Upper Rhine, where even at the present time fairly high A- and B-frequencies are observed.

In the Saxon area we find no high A- and B-frequencies, nor do we see them in the north, the original Frisian region.

However, we do see high A- and B-frequencies in the southern part of the Frisian area: First in the Amsterdam area and furthermore near The Hague and Rotterdam. We may assume Frankish influences to be the cause of the latter. A third region with indeed very low A- but with high B-frequencies is Zeeland. This is not in the least surprising, as the population of Zeeland may contain a Frisian component but cannot be predominantly Frisian, as the Frisians are a people with fair hair and blue eyes, while Zeeland is the province with the highest percentage of dark hair and dark eyes.

Anthropologists have already pointed out that the population of Zeeland must

Table I
ABO Gene Frequencies

Country	O	A	B	Number
Frisians	0.680	0.260	0.060	70,828
Saxons	0.695	0.251	0.055	39,897
Franks	0.665	0.275	0.061	82,325
Total	0.677	0.265	0.058	193,140
Towns	O	A	B	Number
Frisians	0.668	0.268	0.064	103,940
Saxons	0.686	0.255	0.060	12,150
Franks	0.664	0.275	0.062	39,387
Total	0.668	0.268	0.063	155,477
Total Netherlands	0.673	0.267	0.061	348,617

contain a Mediterranean component. In this respect it may be important to point out the low frequencies of Rh negatives which are found in some parts of Zeeland.

When dividing the total material in to 3 groups, it appears that there exist obvious differences in the ABO bloodgroups between the original Frisian, Frankish and Saxon parts of the Netherlands.

These differences are highly significant for the country as well as for the towns. If we compare the country and the towns within the 3 groups, significant differences are observed in the Frisians and to a less degree also in the Saxons.

There is no difference between the Frankish country and the Frankish towns. This shows that the Frisian and Saxon towns have been influenced by the Frankish component of the population, while the Frankish towns were not influenced by the Frisian and Saxon components. It remains doubtful whether this Frankish influence has played a part in the foundation of the towns or if this is of more recent date.

One could imagine that already in the early Middle Ages after the subjection of the Frisians and Saxons by the Franks, a ruling class, a commercial group and soldiers settled in the subjected regions. This group may have founded the first town communities. On the other hand, in the course of centuries until the present time migrations may have occurred from the often poor southern districts to the towns in the north, which may explain this Frankish influence.

There seems to be no obvious correlation between the distribution of the Rh factor and Frisian, Frankish or Saxon origin. The differences between these territories and also between town and country are irregular and less significant or not significant at all. The average percentage of Rh-negatives in the Netherlands is 16.75 %.

Blood Groups in Sephardic Jews

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Sephardic Jews are the descendants of the Jews who were expelled from Spain in 1492 and from Portugal in 1497. There are some indications that Jews settled in Spain in the early centuries of the Christian era.

During their long sojourn in the Iberian peninsula migrations to and from North Africa took place.

The present study is concerned with Sephardic Jews from the Balkan countries (Turkey, Bulgaria, Greece and Jugoslavia), who came to Israel between the years 1949–1957. The ABO, MN and Rh-Hr groups of 200 persons were examined.