

ANTHROPOLOGICAL AND POPULATION GENETIC CHARACTERISATION OF THE ESTONIANS

(WITH RETROSPECT TO BAER'S OBSERVATIONS)

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Baer's observations

In his doctoral dissertation *Morbis inter Esthonos Endemicis* (1814) Karl Ernst von Baer presented anthropological observations about the Estonians. Baer notes first of all that the Estonians belong to the peoples of Finnic origin as they are very close to the Finns who live in Finland, and there is a certain similarity between Estonians, Lapps, Mordvinians, Cheremissians and other tribes of Finnic origin (Baer, 1976:22).

Further Baer describes the body-build and mentality of the Estonians, trying to find a connection between these two characters. He writes that the body of Estonians is rather racy than skinny. Most of the Estonians are of medium stature; the face is mostly quite bloated, indolent, without peculiar features, and pale. Hair is mostly blond, often white in childhood; black hair with darkish complexion also occurs. The physical strength is quite average, temperament, in general, phlegmatic with a slight inclination to melancholy. That might be the reason why their body is not particularly receptive to diseases and as concerns their mind, it only rarely loses its usual nature. In the proper sense of the word, only very few of the Estonians are melancholic – those whom he noted above as the ones with black hair. As a matter of fact, they are short of stature, but with a firmer and stronger frame. They are more serious, obstinate and reserved than the majority, who are phlegmatic. While the face of the latter expresses dullness, the expression of melancholics is that of concealed indignation. There is a great difference, however, between the Estonians living in the northern part of the country and those in the environs of Dorpat (Tartu). The latter exceed the former by the stature and their face which expresses frankness is more easily understandable than that of their fellow countrymen living in the vicinity of Reval (Tallinn); their face is not bloated, they are a little more active, not so slow, and more friendly towards the people of another class (Baer, 1976:29–30).

Further on it appears that this characterisation applies to Estonian males. Women are of quite a different kind. Baer writes that the national characterisation given above can scarcely be attributed to Estonian girls. They are more vivacious, impetuous, more cheerful and singing while working, the thing that men particularly do not do. Their hair is more yellowish than that of men and none of them has black hair (Baer, 1976:30).

These descriptions, of course, reveal the difficulties, which a German-born researcher came across in communication with Estonians. It is also clear that these characteristics are based on comparatively limited estimations and not on measurements or other kind of statistical evaluations. But we would like to point out Baer's sharp-sighted observations indicating that there are various anthropological types among the Estonians, while substantial regional differences also occur.

Diversity of the anthropological types of Estonians

After Baer, in the 19th century and at the beginning of the 20th century, several studies dealing with the anthropology of Estonians were published, but these comprised few data, often of confined local character.

An extensive study of the anthropological characteristics of Estonians began in the 1920–30s. From that time general anthropological variability, also craniological, odontological, dermatoglyphic and genetic traits have been studied. A pioneer in this sphere was Juhan Aul, who carried out solid anthropological measurements all over Estonia. He measured altogether over 50,000 Estonians (adults, children, teenagers), and for comparison also local non-Estonians – Germans, Swedes, Russians – and representatives of neighbouring peoples. In his profound monograph “*Àìòðñîëîâèÿ ýñòíîââ*” (Aõëü 1964), based on the measurements of over 15,000 Estonian young men, he presents numerous body and head measurements, also the colour of hair and eyes, i.e. somatological traits. A number of tables and maps on the distribution of the traits by parishes and counties have been added.

According to somatometric traits, Estonians can be characterised as people of high stature and, correspondingly, with large measurements of the head and face. Regional differences between Estonians are determined by somatometric traits. J. Aul distinguished two main anthropological types among the Estonians – the West-Baltic and the East-Baltic type. Both types are purely Europoid according to J. Aul's estimation. They are characterised by light eyes and fair hair. The most important differences between the two types are following: the West-Baltic type is very high of stature, comparatively dolichocephalic, with a narrower and higher face. The East-Baltic type has somewhat shorter stature; it is more brachycephalic, with a comparatively wider and lower face. Both types are spread all over Estonia (Fig. 1), but the West-Baltic type predominates in West Estonia, in the northern part of Pärnu county, in the western part of Harju county, also in some adjacent

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to them parishes of Järva and Viljandi counties, while the main distribution area of the East-Baltic type is East Estonia from one side and some places in South-West Estonia from the other side. That type is also common in the neighbouring areas east of Estonia. The territories of the distribution of the East- and West-Baltic types are not isolated from one another; large overlapping areas connect them. J. Aul points out the originality of the Estonians comparing the West-Baltic type with the Skandinavian type of the Atlanto-Baltic race and the Estonian East-Baltic type with a more eastern variant even. The cephalic index of the Skandinavian type is smaller than that of the Estonian West-Baltic type. Differences in the head breadth and the shape of face are especially noticeable; the Skandinavian type has considerably smaller head, face and mandibula breadths than western Estonians; the face is also a little lower. The Estonian East-Baltic type has somewhat higher stature than the more eastern form of that. The East-Baltic type in South-East Estonia (especially in Petseri district) slightly differs also from the northern variant in Estonia (Äöü 1964:349). In his work J. Aul indicates a large distribution area of the East-Baltic type extending in north and south, but especially in east direction, failing to specify the exact borders and the centre of this area.

Indexes of Mongoloidness and Pigmentation

Karin Mark has studied somatological traits of the Estonians and other Finno-Ugric peoples in many aspects. As great anthropological variety is typical of Finno-Ugric peoples and among them there occur variants of traits common to eastern peoples (so-called Mongoloid addition), K. Mark has profoundly studied also those traits which clearly indicate the differences between Europoid and Mongoloid great races. She has derived and introduced the indexes of Mongoloidness and Pigmentation. The first of them is based on eight somatoscopic primary traits (as beard growth, cheekbone prominence, direction of eye-slit, etc.). Differences in the distribution of these traits between Estonian regions are not great and sometimes they even show an opposite trend. Altogether they still give a clear east-west tendency. Index of Mongoloidness (MI) shows the position of a group or a region on the scale of Mongoloidness in comparison with the other Finno-Ugric peoples and its neighbours.

The mean value of MI of the Estonians is 24.8. The smallest MI value has been recorded in West Estonia (22.0), followed by the West Islands and North Estonia (23.7), then South-West (24.7), and South-East and



Fig. 1. Anthropological types in Estonia (from Mark, 1994:8): 1 – strong predominance of East-Baltic type; 2 – predominance of East-Baltic type; 3 – nearly even distribution of East- and West-Baltic types; 4 – predominance of West-Baltic type; 5 – strong predominance of West-Baltic type.

North-East (about 26) Estonia (Mark, 1994:51). According to K. Mark the population of West Estonia is almost entirely Europoid. The Mongoloid addition, which is obviously connected with the East-Baltic anthropological type, becomes more noticeable when proceeding to the east. The lowest MI value among other peoples studied was recorded among Finnish Swedes (10.1), followed by western Finns (16.3) and the Russians of Volga districts (18.1). According to the increase of MI value the compared Finno-Ugric peoples can be set in order as follows: Mordvinians-Erza (21.6), Izhorians (26.1), Karelians (28.0), eastern Finns (29.5), Vepses (30.1), Mordvinians-Moksha (32.8), Komis (about 36), Lapps (46.6), Maris (48.3), Khants and Mansi (about 85). It is interesting to note that the difference between the western and eastern Finns is comparatively great, while respective differences in Estonia are quite trifling. The positions of the Estonians and some other Baltic Finns and Finnish Swedes on the scale of Mongoloidness are shown in Figure 2.

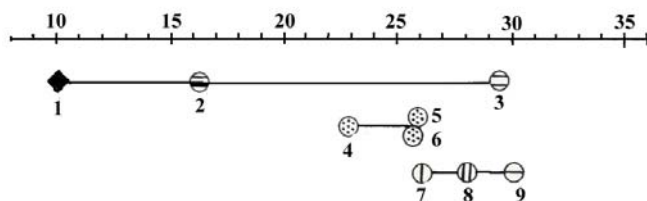


Fig. 2. Index of Mongoloidness (MI) in Baltic Finns and Finnish Swedes (from Mark, 1994:65). 1 – Finnish Swedes, 2 – western Finns, 3 – eastern Finns, 4 – western Estonians, 5 – northeastern Estonians, 6 – southeastern Estonians, 7 – Izhorians, 8 – Karelians, 9 – Vepses.

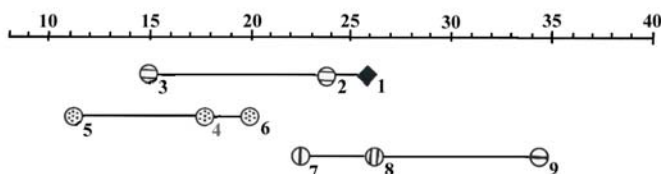


Fig. 3. Index of Pigmentation (PI) in Baltic Finns and Finnish Swedes from Mark, 1994:68). Numeration as in Fig. 2.

The colour of eyes and hair are the pigmentation traits of interest. These traits vary quite largely among Estonians, but light colours are still predominant. In his capital work J. Aul (Äöü 1964:34) states that for the average degree of the lightness of eye colour only very few peoples can compete with the Estonians. The hair colour of Estonians is comparatively even lighter. K. Mark also made use of the so-called Pigmentation index (PI) in which hair and eye colours are summarised. A value of PI from 0 to 20 indicates a very light pigmentation on the scale of Northern and Eastern Europe; values from 20 to 40 indicate light pigmentation, values 40 to 60 indicate medium pigmentation, etc. According to PI the populations of the West Islands, the Setu and the southwest region are of a bit darker pigmentation (PI 22.3–23.4) and the value of it indicates light pigmentation. In the other regions pigmentation is very light, especially in North-East, Central, and North Estonia (PI 12.6–13.8) (Mark, 1994:53). In comparison with the neighbouring peoples, the very light pigmentation of Estonians is especially conspicuous. Of the peoples of the Baltic states the Latvians and Lithuanians have a slightly darker pigmentation of eyes and a noticeably darker hair pigmentation than the Estonians (PI, accordingly, 22.5, 25.8 and 17.8). All the Balto-Finnic peoples and also Finnish Swedes have light or even very light pigmentation. Among them the lightest pigmentation have northeast Estonians (PI 11.2), eastern Finns (15.0) and west Estonians (17.8); southeast Estonians have a slightly darker pigmentation (20.0), then follow Izhorians (22.5), western Finns (22.5), Finnish Swedes (25.8), Karelians (26.0) and Vepses (34.4) (Mark, 1994:67; Fig. 3).

K. Mark has examined the MI and PI values on a correlation field (Fig. 4). It appears that there is no positive correlation between the values of these two indexes: most of the groups with larger values of MI belong to the lightest ones as concerns PI (as Central and North-East Estonia). The same phenomenon appears in Finland and also among some other Finno-Ugric peoples. On the basis of that K. Mark assumes that a strong depigmentation process has already taken place in the groups having Mongoloid admixture. Thus, the most depigmented are northeast Estonians and eastern Finns, but they are not the most Europoid (with the lowest value of MI) populations (to which belong the Finnish Swedes and western Finns). Comparatively close to Baltic Finns by their light pigmentation are Mordvinians-Erza and Komi-Zyrians (PI 34.9 and 36.6) while Mordvinians-Erza (MI 21.6) like western Finns are more Europoid than Estonians.

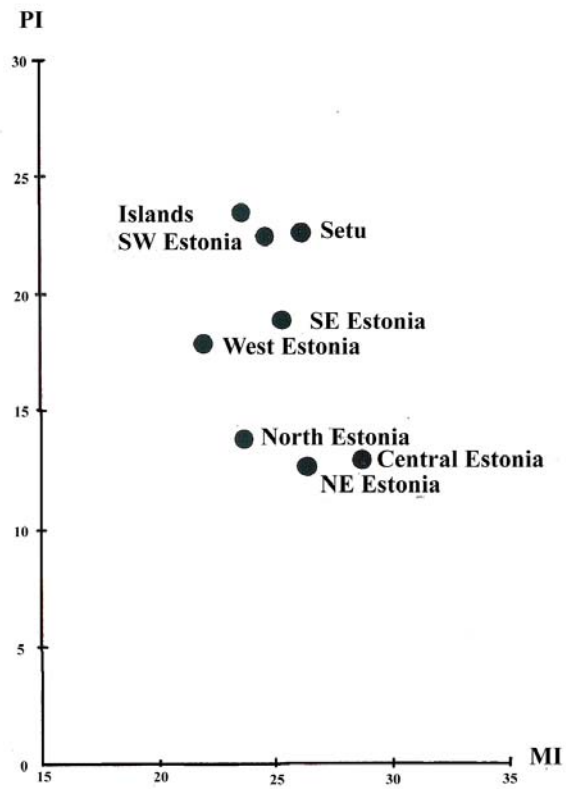


Fig. 4. Correlation of indexes of Mongoloidness (MI) and Pigmentation (PI) in Estonian regions.

Somatometrical traits. Stature

According to somatometrical traits the closest to Estonians are Finns, followed by Mordvinians-Erza, Karelians, Trans-Carpathian Hungarians, Mordvinians-Moksha, Izhorians, Komi-Zyrians and Vepses. It appears that the Mordvinians, Komi-Zyrians and Trans-Carpathian Hungarians do not generally differ from the Estonians more than eastern Balto-Finnic peoples, but the differences observed are based on different combinations of traits. Other Finno-Ugric peoples differ more from the Estonians.



Fig. 5. Odontological types of peoples in North-East Europe (from ^{Àáàààà} 1987).
 1 – Central European type, 2 – North European relic type, 3 – Central European type with the component of North European relic, 4 – Northern gracile type, 5 – North European relic type with the component of northern gracile complex, 6 – odontological complex with all 3 odontological types.

From all the somatometrical traits the stature is most studied. The Estonians is one of the tallest peoples in Eurasia. So, for example, the tallest men born in the middle of the 19th century and recruited for the Russian Army came from Kurland (average stature 167 cm), from Livonia and Estonia (166.7 cm) (Àíó-èí 1889). According to J. Aul 66.6 % of the Estonian men belong to the category of tall or very tall men (proceeding from Martin's well-known classification of body height, according to which the body height of men is estimated as follows: below 150 cm – very short stature, 150 to 159 cm – short stature, 160 to 169 cm – high stature, and over 180 cm – very high stature). The tallest men in Estonia lived on Muhu Island, in Läänemaa, northern Pärnumaa and in Saaremaa, the shortest men – in northern Tartumaa, southern Võrumaa and especially in Setumaa. Comparing the Estonians with kinsmen and neighbouring peoples, J. Aul established that Estonians belonged to the tallest people, and only Livonians, Swedes and Norwegians turned out to be a little taller (Àóëü 1964:46).

Besides genetic factors, the human stature also depends on the environmental factors. In the course of time the body height has gone through quite big changes according to the secular trend. An increase of the height in time can be observed in all the regions of Estonia through all the generations studied. For decades the tallest

men came from Läänemaa. During a period of five decades (1800–1849) the stature increased on an average by 2.7 cm (from 166.4 cm to 169.1 cm) in Läänemaa. During the same period the average body height of men born in Harjumaa increased by 3.2 cm (from 165.5 to 168.7 cm). The number of short men is bigger in Järvamaa and Virumaa. The men born in these regions in 1800–1809 had an average height of 164.3 cm (Aarma, 1987:127). Regional differences remained regardless of the secular trend. These differences can be connected with anthropological types (West- and East-Baltic types). The tempo of stature increase has changed. The secular trend has accelerated especially since the 1920s. The average height of the Estonian men in the 1930s was 172.03 cm, varying from 174.2 cm on Muhu Island to 170.1 cm in Petserimaa (Äöü 1964:49). In the 1970s the average height was 173.3 cm (on West-Estonian Islands and mainland – 175–176 cm, in East Estonia it was smaller – 171 cm in the Setu group) (Mark, 1994:87). Good examples of an increase in stature are those of Saaremaa and Muhumaa. According to the 1992 records the body height of 18–60 years old men on Muhu Island and in western Saaremaa (Lümanda district) varied as follows: in the group of 35–60 years old men – 177 cm, and in the group of 18–34 years old men – 180 cm (Heapost, 1997).

Odontological traits

Anthropological odontology deals with varying traits of teeth. Odontological traits are racial peculiarities, divided into so-called “eastern” and “western” traits. The distribution frequency of eastern traits increases in east direction and attains its maximum in Mongoloid populations; the frequency of western traits increases in west direction. Complexes of traits characterising different odontological types have been established (Çóáâ 1979). The types established mainly in East European (former SU) regions are: the southern gracile odontological type in the Caucasus; the Central European type occurring mainly in Lithuania, Byelorussia, the Ukraine, in Central and Southern Russia; the northern gracile type, which is mainly spread among Finno-Ugric peoples, but also occurs among Latvians and northern Russians; and the North European relic type, which is also typical of Finno-Ugrians, but has been recorded among eastern Latvians, too.

Galina Sarap (1994) has studied the distribution of odontological traits and odontological types among Estonians. According to her studies one can find the following odontological types on the territory of Estonia: 1) The Central European type on western islands and in West Estonia, and in some parts of northern, eastern and southern Estonia. This type is characterised by a low frequency of eastern traits and a high frequency of western traits, and by strong reduction of lower molars. It is a Baltic variant of the Central European odontological type. The majority of Lithuanians, western Latvians, Russians from Central Russia and some groups of Swedes are representatives of the classical form of that type. 2) The northern gracile type is spread in central and northeast parts of Estonia, and in some parts of North, South-West and South-East Estonia. The type is characterised by a high frequency of eastern and western features occurring in parallel, and a strong reduction of lower molars. That type is common among southwestern and northwestern Finns, Karelians and Maris. 3) The influence of the North European relic type is noticeable in North, East and South Estonia. In a pure form, this type occurs among northeastern Finns, Lapps and Komis, in a mixed form also among eastern Latvians. A peculiarity of this type lies in the coexistence of western features in a moderate frequency, and of some typical eastern features in a high frequency.

A conspicuous peculiarity of the northern gracile type is well expressed in the quantity of ISC (Index of the Specific Combination). Usually, ISC does not exceed 150 (neither in Europoids nor in Mongoloids), but it is always larger among the representatives of the northern gracile type, attaining the value 200–300 and even higher.

The regional distribution of ISC indicator in Estonia is rather interesting (Sarap, 1994:232). North-East Estonia is especially prominent with ISC (502). Very high values of ISC (300–500) also occur in several South Estonian groups. Somewhat lower, but yet comparatively high values of ISC (220–290) have been recorded in Central Estonia. In all these regions, in G. Sarap’s opinion, predominates the northern gracile type, however, with an addition of other types. Especially low are ISC values in the dialect regions of the West Islands, of West Estonia and East Estonia (accordingly, 72, 91 and 81). The two former regions correspond to the distribution area of the Central European type, whereas in the latter, besides the Central European odontological type, there is also a certain influence of the North European relic type observed. So the odontological data also show a considerable heterogeneity of Estonians, in which typical Finno-Ugrian and some westward complexes of traits have been mixed.

The Estonian odontological complexes have been compared with those of the Baltic states, Finland and other neighbouring territories using the traditional selection of eastern and western odontological traits. According to that Estonians are mostly close to Latvians, Lithuanians, Trans-Carpathian Hungarians, western Swedes and northern Russians. In general, the Central European odontological type dominates in all of them. Northeast Estonians are situated close to northwest and southwest Finns. In these groups predominates the northern gracile type. The Estonian regions (East and South-East Estonia) influenced by the North European relic type are situated comparatively close to the other Estonian regions, but have a somewhat peculiar inclination towards the classical representatives of the North European relic type, the Lapps, and the other

ethnic groups influenced by the North European relic type – eastern Latvians, southeastern Finns, Karelians and Vepses.

In Latvia, according to R. Gravere (1987), mainly the same odontological types are represented which occur in Estonia – the Central European and the northern gracile type. Besides those, the North European relic type is also found in eastern Latvia, mainly on the territory of the East-Baltic anthropological type and it seems to be connected with the Balto-Finnic substratum. The northern gracile type is spread on a quite wide territory in Latvia, also on the territory of the narrow-faced variant of the West-Baltic anthropological type. That covers districts once inhabited by Livonians and South Estonians, extending in places far off in southern direction. The occurrence of the northern gracile type traits among other peoples is a clear evidence that in these regions Finnic peoples have mixed with the other ethnic groups. Such a situation occurs in northwestern provinces of Russia. The distribution of odontological types in North-East Europe is illustrated in Figure 5 (1987:131).

Craniological data

Racial dualism of the Estonians is also observable in paleoanthropological material, first of all, on the basis of craniological studies. The investigations of the Estonian paleopopulations and the distribution of anthropological types in Estonia using the craniological material have mainly been carried out by K. Mark (1956; 1965). According to K. Mark, two main clearly distinguishable craniological types have been established among the Estonian cranial samples (Fig. 6). One type is characterised by very large measurements, massive, with long, narrow and high dolichocran skulls, with a high face and narrow nose. That type occurred almost everywhere in Estonia in the pit graves of the 11th–13th centuries – in West and North Estonia (at Martna, Haimre, Kūti, Tammiku) and also in Tartu district (Õvi, Lahepera). The Karja sample from Saaremaa (Mark, 1965) as well as the Viiraküla sample from Muhu Island (Heapost, 1997) also belongs to that type. The other type is mesocranic, more gracile, with a broader, lower and slightly flattened face. That type is spread in East Estonia (as indicate the skulls from Jõuga mounds in North-East Estonia, the skull samples from South-East Estonia – Otepää, Makita and others from the 11th–15th centuries and later) (Mark, 1965; Heapost, 1993). Both these types are Europoid. Deciding by the long bones the first type was high of stature (about 172 cm) and the other of a little shorter stature (about 167–168 cm) (Mark, 1962:178; Heapost, 1993:247). It can be said that the modern anthropological types in Estonia were established in the Medieval time already. Their roots can be found in the Estonian Neolithic.

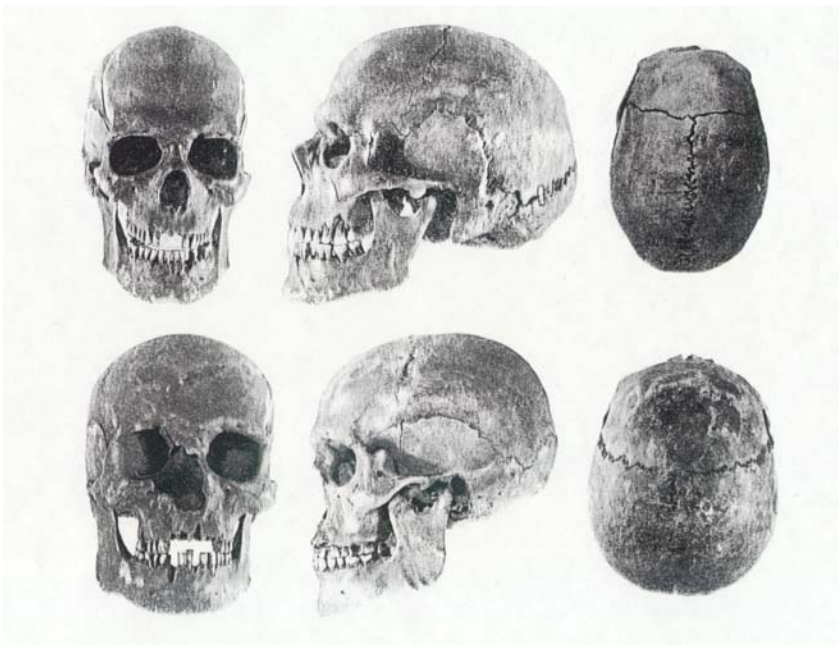


Fig. 6. Craniological types from Medieval times in Estonia (from Mark, 1965). Above: A dolichocran male skull from North Estonia, 13th century (Kūti). Below: A mesocran male skull from North-East Estonia, 12th-14th centuries (Jõuga).

The cluster analysis of the Estonian cranial samples once more assures us of the presence of these types among the Estonian paleopopulation (Heapost, 1995, 1996). Two clusters are formed. The Neolithic sample of Boat-Axe Culture in Estonia also belongs into the dolichocran skull cluster. The sample of Neolithic Comb-Ware Culture from Eastern Estonia belongs to mesomorphic, mesocran cranial samples. Features of both types

can be found simultaneously in one or another sample. According to the complex of features some series stay in-between the two cranial types. Estonian cranial samples have been compared with those of the neighbouring areas belonging to different periods of time (from the Medieval time to the Mesolithic). A large variety of cranial samples has been compared. Most of these samples belong to the mesocran anthropological type with some local variations, and all the cranial samples from North-West Russia used for comparison, form completely mixed clusters with Finno-Ugric samples. The anthropological type which is represented by East Estonian cranial samples was spread in Finland and Karelia, in the Novgorod and Pskov regions, and in Tihvin district, on a large territory in Latvia, partly in Lithuania, in some areas of the Volga-Oka and the Volga-Kama already as early as in the 3rd–9th centuries A. D. Evidently, these population groups were closely related. Apparently, that anthropological type in one or another variant is connected with the ancient substratum population of the East Baltic on a wide territory of North and East Europe.

People close to the dolichocran type of the populations of Medieval Estonia (particularly in West and North Estonia) also lived in some southern Baltic areas. That dolichocran anthropological type could already be found among the carriers of Boat Axe Culture in Neolithic Estonia and among the Mesolithic inhabitants of Zvejnieki in Latvia near the border of Estonia. That anthropological type is also represented by the carriers of Fatyanovo culture in the Volga district, and by the Kivutkalns population of the Bronze Age in Latvia. Features or complexes of features characteristic of the two main anthropological types occur in one or another form in several cranial samples observed.

Thus, the anthropological types spread in Estonia were common over a wide territory and for a long time. Forms similar to the Medieval cranial samples of Estonia can be traced back to the local Bronze Age, the Neolithic and the Mesolithic.

Population genetic data

Our genetic data are based on seven blood group systems (AB0, Duffy, Kell, Lewis, MN, P, and Rhesus) and the trait of phenylthiocarbamide (PTC) tasting (altogether 24 alleles). Leiu Heapost collected the material from 39 localities in different regions of Estonia (Heapost, 1994:112). All the individuals examined were indigenous Estonians, whose grandparents and parents had been born in the same locality. The local samples were joined into seven regional groups more or less according to main dialectal areas (Murumets, 1982, 1983).

Differences in gene frequencies between regional populations are valued by the chisquared method. The degree of the genetic diversity of the groups is determined by the method of genetic distances (Cavalli-Sforza & Edwards, 1967). The grouping of populations on the basis of those distances is carried out by using cluster analysis.

Data for international comparisons were taken from literature: for Finns and Finnish Swedes from Nevanlinna (1973), for Karelians from Y. V. Shneider (Õiáéäää 1991), for Komis from A. V. Érikson & R. R. Frants (Ýðèèñîî è Óðáíõñ 1982), for Latvians from L. Heapost (1994), J. Kariks et al. (1966), and R. R. Race et al. (1948), for Lithuanians from R. G. Harvey et al. (1983), for Maris from A. V. Érikson (Ýðèèñîî et al. 1979), for Russians from M. A. Umnova et al. (1968), and for Vepses from L. Heapost (1994).

The data on gene frequencies for Estonians are given in M. Viikmaa and L. Heapost (1996:131). It appears that there are relatively great differences between regional subgroups, especially in Duffy, Lewis and Rhesus systems. Our genetic data are in good agreement with the anthropological investigations suggesting that the

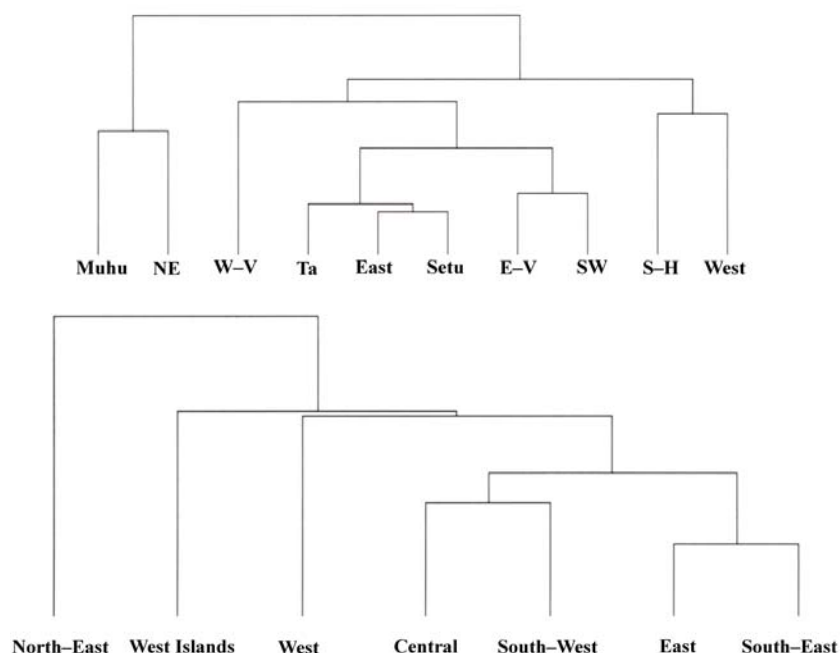


Fig. 8. Grouping of Estonian main regional populations based on cluster analysis of genetic distance matrix (from Viikmaa & Heapost, 1996:132).

greatest differences in Estonia can be found between the subpopulations of the western and eastern regions: the genetic distance between these groups is about 3.5 times bigger than that between the northern and southern ones.

The results of grouping of some local populations on the basis of genetic distances are shown in Figure 7. As a rule most samples are clustered very well into bigger regional groups with their nearest neighbours. However, there exist two exceptions. First, the sample of Muhu Island is clearly different from the other West Island (Saaremaa and Hiiumaa) samples, being clustered together with the northeast group. Secondly, the sample of the West-Võru dialect area (the Antsla sample) stands relatively far from the other southeast groups. At the same time, the Setu sample is closely related to most of the South-East and East Estonian groups.

As a next step, we considered the clustering of regional populations with one another. The regions regarded coincide with the main dialectal regions. The genetic differences between all the regions are statistically significant, with the exception of the East group, which is very similar to the groups of southern regions. As

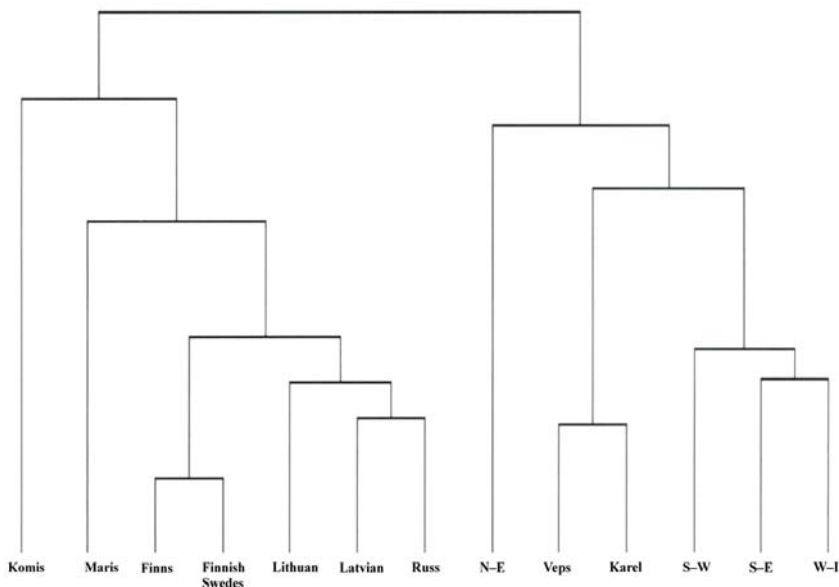


Fig. 9. Grouping of Estonian regional populations with some neighbouring and other Finno-Ugric peoples based on cluster analysis of genetic distance matrix (from Viikmaa & Heapost, 1996:133). Lithuan – Lithuanians, Latvian – Latvians, Russ – Russians, N-E – North-East Estonia, Veps – Vepses, Karel – Karelians, S-W – South-West Estonia, S-E – South-East Estonia, W-I – West Estonia with West Islands.

demonstrated by the dendrogram of genetic distances (Fig. 8), the central, southwest, east and southeast regions are very tightly connected. The West Islands, North-East and West Estonia are standing separately.

Next we compared some regional populations of Estonians with the neighbouring and some Finno-Ugric peoples (Fig. 9). The populations were grouped into two main clusters. The Estonian samples were joined together in one cluster with the two Finno-Ugric populations of Vepses and Karelians. The second cluster consisted of the Finno-Ugric populations of Komis and Maris (both standing alone), and Finns, as well as the Finnish Swedes, Lithuanians, Latvians, and Russians. Thus the Finno-Ugric linguistic group is clearly not a genetic unit.

The genetic distances of the whole Estonian population to other peoples (Table 1) suggest that the Estonians are most closely related to their nearest neighbours – the Russians and Latvians. In addition, the Vepses and Karelians are very close to the Estonians; the Finns come only after them. On the given dendrogram (Fig. 9) the Russians and Latvians fall into the second cluster because they have other more closely related populations than the Estonians – the Lithuanians, Finns and Finnish Swedes.

There is an interesting difference between the genetic structure of the Estonian population and that of the Indo-European neighbours. It lies in the simultaneous presence of gene frequencies of different types. Namely, some gene frequencies (AB0*A2, AB0*B, RH*cde, RH*CDE, PTC*t) are characteristic of more eastern peoples, whereas the others (Fy, Kell, Lu, RH*Cde) show frequencies of a more western type.

Conclusions

All the types of study presented in this paper reveal a remarkable heterogeneity of the Estonians. In general, the differences are more impressive in western-eastern direction than in northern-southern direction. Some

subgroups of Estonians, especially in the northeast and southeast show peculiarities characteristic of some more eastern Finno-Ugric peoples, whereas the western groups (especially in the West-Estonian mainland) are more strongly associated to the Indo-European neighbours. All that suggests that the Estonians have a complex origin, indicating relations to the Finno-Ugric stem on the one hand, and to the Indo-European peoples on the other hand.

Some combinations of traits and gene frequencies characteristic of Estonians and many other Finno-Ugric populations showing simultaneously “eastern” and “western” frequencies (for example, negative correlation of indexes of Mongoloidness and Pigmentation, the northern gracile odontological type, and some gene frequencies) cannot be explained only by the assumption of Mongoloid admixture to the Caucasoid populations. We suppose that the antagonistic frequencies of different traits are tracks of the original genetic structure of the Finno-Ugric ancestor population, which were not clearly differentiated in Mongoloid-Caucasoid directions.

Table 1. Genetic distances by Cavalli-Sforza & Edwards (1967) between the Estonians and some neighbouring and Finno-Ugric peoples

	Latvians	Finnish Swedes	Finns	Maris	Komis	Karelians	Vepses	Estonians	Vepses	Karelians	Komis	Maris	Finns	Finn. Swedes	Latvians	Lithuanians	Russians
Lithuanians								0.0069									
							0.0029	0.0074									
					0.0120		0.0168	0.0167									
					0.0082	0.0104	0.0128	0.0189									
				0.0080	0.0106	0.0096	0.0089	0.0108									
			0.0017	0.0100	0.0103	0.0095	0.0075	0.0115									
		0.0063	0.0041	0.0079	0.0120	0.0073	0.0085	0.0064									
	0.0045	0.0042	0.0055	0.0085	0.0133	0.0094	0.0072	0.0114									
	0.0033	0.0032	0.0043	0.0058	0.0081	0.0059	0.0066	0.0065									

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