

Brief Communication: Cerumen Phenotypes in Certain Populations of Eurasia and Africa

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ABSTRACT Cerumen polymorphism was studied in several populations of Eurasia and Africa. The frequencies of dry cerumen were shown to be high in Mongoloid populations and low among Europoids. Intermediate frequencies were found among peoples of subequatorial Africa. Special attention is paid to the potential for using this marker in population and anthropological studies.

B. Adachi in 1937 was the first to call attention to cerumen dimorphism in *Homo sapiens* (Matsunaga, 1962). Human cerumen occurs in two phenotypically distinct forms—dry and wet. Wet cerumen is light tan to dark brown and has a sticky consistency, while dry cerumen ranges in color from grey to tan and is granular or scaly in nature. Matsunaga (1962) concluded that cerumen phenotypes are determined by one gene, in which the allele for the wet form (W) is dominant over the dry (w). A homozygous subject (WW) is thus phenotypically undistinguishable from a heterozygous one (Ww), since both have wet cerumen. Subsequent studies of cerumen inheritance patterns (Petrakis et al., 1967; Das, 1977) have similarly concluded that cerumen phenotypes are inherited as a simple Mendelian trait. Cerumen phenotype frequencies have accordingly been used in population genetic and anthropological studies (Matsunaga, 1962; Petrakis et al., 1967; Petrakis, 1969, 1971, 1983; Ing et al., 1973; Powson and Milan, 1974; Morton, 1976). In this paper we present data on cerumen phenotypes, obtained in several populations of Eurasia and Africa, representing three human groups of the Old World.

MATERIALS AND METHODS

Cerumen phenotypes were determined by conventional bilateral otoscopy, described in detail by Petrakis et al. (1967), and were classified as dry or wet according to the criteria of Matsunaga (1962). Observations were collected during 1982 and 1983 in the course of our cytogenetic studies of human

populations of Eurasia and Africa (Ibraimov and Mirrakhimov, 1982a–c, 1983; Ibraimov et al., 1982). Racial and ethnic characteristics of the populations studied are presented in detail in the reports cited above. A total of 2,779 subjects of both sexes, aged 13–21 years, was studied. Sibs and half-sibs were not included in the analysis.

RESULTS

Data on the distribution of cerumen types in our samples are presented in Table 1. For the sake of convenience, the populations are arranged in descending order of the declining frequency of gene q. Standard errors are also indicated. This table shows that dry-type cerumen predominates among Mongoloids of Central Asia but occurs less frequently in Negroids of subequatorial Africa and still less frequently in Russians living in Frunze (Kirghiz, SSR). In this series, the Turkmen—Europoids from the Kara-Kum desert—occupy an intermediate place between Mongoloids and Negroids.

DISCUSSION

On the whole, our results are consistent with those in the literature: the frequencies of dry cerumen are high in representatives of the Mongoloid race, whereas the values of gene q are low in Europoids and Negroids (Matsunaga, 1962; Petrakis et al., 1967; Omoto, 1975). In our Mongoloid sample, the highest frequencies of gene q occur in representatives of the Central-Asian (Touvinians

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TABLE 1. Frequencies of cerumen phenotypes

Population and location	Sample size	Dry cerumen			S.E. ¹
		No	%	Gene frequency (q)	
Touvinians, Touva, USSR	173	136	78.6	0.8866	0.018
Mongolians, MPR	74	58	78.4	0.8854	0.027
Chinese (emigrants from North China), USSR	281	220	78.3	0.8849	0.014
Altains, Mountain Altai, USSR	190	138	72.6	0.8521	0.019
Kirghiz of Tien-Shan and Pamir, USSR					
1. Batken Region	199	142	71.4	0.8450	0.019
2. Ak-Tala Region	120	82	68.3	0.8264	0.026
3. Talass Region	173	117	67.6	0.8222	0.022
4. Lajlak Region	173	115	66.5	0.8155	0.022
5. Tien-Shan Region	157	103	65.6	0.8099	0.023
6. Manas Region	207	134	64.7	0.8044	0.021
7. Murgab Region	115	74	64.4	0.8025	0.026
8. Alai Region	133	84	63.2	0.7050	0.026
(Total)	(1,277)	(851)	(66.6)	(0.8161)	(0.008)
Khakass, Khakassia, USSR	74	47	63.5	0.7969	0.035
Kazakh, Kazakh SSR, USSR	145	88	60.7	0.7791	0.026
Turkmen, Turkmenia, USSR	155	84	54.2	0.7362	0.027
Mozambiquans, Mozambique	66	35	53.0	0.7280	0.042
Ethiopians, Ethiopia	96	47	49.0	0.7000	0.036
Angolans, Angola	41	17	41.5	0.6442	0.060
Russians, Frunze, USSR	207	72	34.8	0.5899	0.028

$$\sqrt{1 - q^2/4N}$$

and Mongolians) and East-Asian (Chinese) types, whereas the lowest occur in those of the South-Siberian type (the Kirghiz, Kazakhs, and Khakass).

It is difficult for us to judge whether the data obtained by different authors are comparable, despite the relative simplicity of methods for cerumen determinations. Usually, the percentage of subjects with an uncertain cerumen type does not exceed 0.5% (Matsunaga, 1962). The available data show good agreement. Thus, the frequencies of gene *q* in pure-blooded Navaho (*n* = 162) and Sioux Indians (*n* = 113) of North America are 0.835 and 0.685, respectively (Petrakis et al., 1967), and 0.696 in Aleutians (*n* = 140) of the Aleutian Islands (Petrakis, 1969). In Eskimos (*n* = 406) living in various regions of Alaska, this value ranges from 0.696 to 0.782 (Powson and Milan, 1974; Bass and Jackson, 1977). Omoto (1975) has reviewed data obtained by Japanese and Chinese investigators who studied various populations living in Japan and Taiwan. According to that review, the frequency of gene *q* in the Chinese samples ranges from 0.830 to 0.952 (mean 0.920), whereas in Mongolians (only two samples, *n* = 778 and *n* = 321) it was 0.931 and 0.952. Gene *q* frequencies ranged from 0.694 to 0.986 in the Japanese (mean 0.895) and from 0.612 to

0.847 in Taiwan natives (mean 0.711). In short, almost all the Mongoloid peoples of both the Old and New Worlds are characterized by high gene *q* frequencies. The only exceptions are those "Mongoloid" populations that have experienced a significant degree of recent European admixture—e.g., in several Indian tribes of North America. For example, Petrakis et al. (1967) report that in Dakota Indians of the USA, who have long-standing (over more than 150 years) marital contacts with Europoids, gene *q* frequency is 0.299, whereas in American whites it is 0.210.

Table 1 shows that Turkmen are intermediate in gene *q* frequencies between Mongoloids and Negroids of subequatorial Africa. This tallies with other indicators of genetic affinity among Turkmen populations. During our extensive population genetic studies, we were able to demonstrate that inverted chromosome 3 (i.e., pericentric inversion of its Q-heterochromatin band) is an informative "Europoid" cytogenetic marker (Ibraimov and Mirrakhimov, 1982a-c, 1983; Ibraimov et al., 1982). Frequencies of this marker among Turkmen approximate those among Europoid populations known to have a significant Mongoloid component in their ethnic composition (Ibraimov and Mirrakhimov, 1983). Moreover, 40.4% of the Turkmen

individuals we examined exhibit an epicanthus, a classical anthropogenetic Mongoloid trait that was also recorded during our population studies. All these data suggest a substantial degree of genetic affinity between the supposedly "Europoid" Turkmen and typical Mongoloids. This suggestion is not at variance with the observations of earlier ethnographers, who considered contemporary Turkmen as Europoids with a Mongoloid admixture (Bartold, 1929). Likewise, a considerable degree of Mongoloid admixture can be inferred for Russian populations from their high frequencies of dry-type cerumen. In our sample, 34.8% of Russians have dry cerumen, as contrasted to only 8.6% of Germans and 4.4% of American whites (Matsunaga, 1962; Petrakis et al., 1967).

The finding of high frequencies of dry cerumen in Negroids of Mozambique, Angola, and Ethiopia is very surprising in view of the fact that the former two populations are Bantu-speaking and might be expected to have very low frequencies of the dry allele. Both Matsunaga (1962) and Petrakis (1971) found that almost 100% of U.S. Blacks have wet cerumen. The Ethiopian population is the result of an admixture between Negroid populations from the west and Caucasoid populations from the north-east (Selassie, 1972). It is possible that Mongoloid populations might also have contributed to the Ethiopian gene pool, although historical data on this point are lacking. It is also possible that currently unidentified selection pressures might have operated to elevate frequencies of the q allele in any or all of the three African populations sampled here.

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