PROBABILITY OF DIFFERENT DIAMETERS DISTRIBUTION OF HAIR ON THE HEAD

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SUMMARY

The article encompasses a possible concept of description of the structure of hair thickness distribution over women's heads. It is based on real data realized in Caucasian population and results in the necessity of introduction of several type groups of women's heads coverage. With an example included, it eliminates the possibility of the distribution to be random and that there are all of the possibilities of the distribution realized in the population, as well as that it could be reasonable to average these distinct type groups and look for the mean distribution in the population. The distribution structure is most likely contingent on genetics and is entrenched in some part of the DNA; it is not yet clear however, what intra-species advantages particular structure types could yield, while the correlation of the particular distributions with types of humans is subject to current research.

Keywords: human hair, diameter, capillitium

INTRODUCTION

There exists quite a number of works dealing with human hair diameters in dependence on the ethnic group or the age of the individuals. Only few of these works take into account the individuals' sex and, with a few exceptions, they don't mention from which part of the head surface the hair had been taken. Just in several works the authors refer to the sample taking place and they try to keep it constant for the whole set under investigation. The original intent had been to find a single map of hair thickness on the women's head surface. As it turned out, it has been necessary to introduce several such maps, for to the results to give consistent evidence.

Differences among hair

Most common interest in hair is focused on hair growth, hair types and hair care, but hair can also be looked at as an important biomaterial, that can vary depending on the ethnic ancestry or the age [2]. In some children at the age of two to three years the hair type and colour change can be remarkably rapid [1]. Limited experimental data show that children's hair is more transparent with tendency to higher clearness [3]. In teen-agers at the beginning of puberty, the change of the hair character and distribution is most prominent.

Terminal hair, that occurs in various localisations at that time and replaces the intermediate type of capillitium or the fine vellus on the body surface, is relatively long, well pigmented and contain medulla either fragmented or in the whole stem length. The coarse capillitium hair of adolescent boys is more medullated then the finer girls' hair in most cases [1].

The work [4] addresses the differences between pigmented and non-pigmented (grey) hair. It states that grey hair is more firm, wire-like. [5] states in his work that the differences between pigmented and non-pigmented hair need not hold in general, what applies for one person that its hair is significantly thicker, need not apply for another person. Decrease of the hair volume on the head surface, and also drop of the hair diameter, is not only reflection of aging, but also reflection of some internal change in the hair itself [6].

METHODS

We have been taking by five samples from five different areas of the head surface. These areas have been denoted by letters of alphabet: A – left temple, B – the place above the forehead centre, C – right temple, D – vertex, E – occiput. The hair has been cut with sharp scissors close to the head and immediately put in a labelled polythene bag with zip fastener.

Using optical microscope, the diameters have been measured in four distinct places along its length with fivefold repetition. From the diameters obtained this way, one average diameter for a particular hair has been calculated. For each sample taking place five hairs have been measured this way.

We've calculated the mean value for these five times measured five samples.
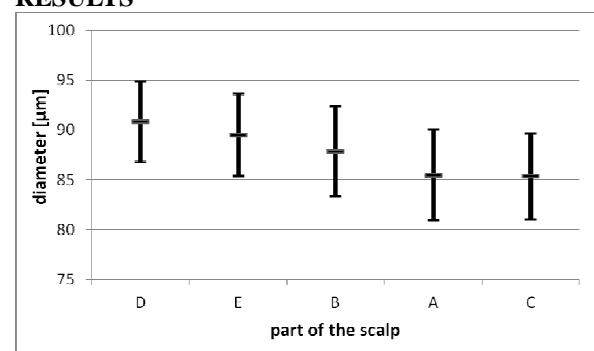
RESULTS

Diagram 1 Particular head surface areas sorted by mean hair diameters on all researched heads. With the mean values standard deviations of the measured hair sets are also marked.

Legend to Diagram 1 and Diagram 2:
A left temple
B the place above the forehead centre
C right temple
D vertex
E occiput

DISCUSSION AND CONCLUSION

First thing to come to our mind when attempting to find a distribution scheme is to sort the investigated areas e.g. in ascending order and calculate standard deviations in particular areas. The result can be seen in Diagram 1.

When we sort the particular areas by increasing mean diameters, we get five-letter codes for particular women. As can be seen, the code structures arising in the example are far from random ones. They do not e.g. tend at all to realizing all permutation alternatives and not by a long sight evenly. The C area occurs in the whole of 62 % cases in the first two places of the code (so it contains either the thinnest hairs, or the second most thinnest), while in case of random distribution the probability would be only 40 %. Areas A and C often occur side by side, in 50 % women (when random would give 25 %). There is an interesting phenomenon when the thinnest hairs are contained in the E group. This area is often in some way reciprocal to the most frequent distribution and always! ends with the C area, that, as we have said, mostly starts the sequence.

When we display the order (Diagram 2) we can see a break-up into several groups, as the probability of all 120 variations is evidently different. At most 102 of them realize. The others occur no more in the population. The probability alone of the occurrence of the thickest and the most thin hair at particular places is not identical evidently. Detailed investigation of hair thicknesses in the particular areas of women's heads has shown, that there doesn't exist a single structure of distribution of these diametres, but it is necessary to introduce several of these structures right away. Between these structures there are most likely no smooth transitions, hence their genetic conditionality seems to be probable. We consider proven the existence of groups CXXXD, a small but rigid group with at most one permutation EBDAC and the BXXXY group where Y means the A or D area, and X the remaining ones. It's also interesting that the DBXXX code is always unambiguously the DBCEA one. For 90 % distributions it also holds that knowledge of the first three symbols XXX?? unambiguously determines the order of the remaining two. We believe that by deepening our knowledge of Diagram2, we will be able to figure out the genetic determinateness of the hair thickness distribution, i.e. the XXXXX sequence, on the womens' heads. Most women's hair with the lowest diameter of C (right temple).

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Diagram 2 Representation of the probabilities of the occurence of particular distributions in a tree form. The letters indicate the place on the head surface, the numbers and the line thickness denote the probability of the combination's occurence (eg. E.21 means that 21% of code starts with the letter E; C5 means that the code ends in 5 cases point C).