

Degrees of Blood Relationship – Review and Recommendations

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During the communist ruling genetics was among the most damaged fields of the science. Like in remaining “socialist” countries, several generations of Bulgarian medical doctors and biologists finished their higher education with absolutely insufficient knowledge in this topic. Therefore, when finding errors in this field, made by Bulgarian authors, we are inclined to excuse them, having in mind the gaps in their genetic education. Surprisingly, severe mistakes in determination of the degrees of blood relationship appeared in papers published by western authors, which could not benefit the mentioned excuse. The present work systematizes these mistakes and recommends the possible measures to avoid them in future investigations.

Key words: laterality, handedness, genealogical analysis, errors, recommendations.

Introduction

In many branches of medical investigations a hereditary causes of (or at least predispositions to) different diseases are known or suspected. In such cases the drawing and analysis of genealogical trees, known as a genealogical method, are not only applied, but represent an extremely substantial approach. An important part of its application is to determine the degree of blood relationship between two subjects presented in the genealogical tree.

When applying genetic methods and meeting methodological errors, made by Bulgarian investigators, we are inclined to excuse them by gaps in their genetic qualification, due to the conditions in the former communist camp, where pseudo-scientists who had nothing to do with the real science (like Trophim Denisovich Lisenko and Olga Ivanovna Lepeshinskaya) were academicians and Stalin-prize winners and, just the opposite, great geneticists like Mendel, Morgan and Weisman were stigmatized as retrograde western scientists. However, such an excuse could not be applied towards western scientists, having been normally educated.

For many years we deal with morphological and functional asymmetries in man, the morphological one focused on the finger and palm prints (dermatoglyphics) and the functional one presented by the lateralization in sensory and motor functions (handedness, footedness, eyedness, hand clasping, arm folding, etc.). Genetic factors are con-

sidered to play a substantial role in their determination and therefore the genealogical method is undoubtedly very important in their investigation. Surprisingly, in several publications of western authors in very respectable journals we found astonishing mistakes in determination of degrees of blood relationship.

The aim of the present study is to remind the correct procedure for determination of the degrees of blood relationship, to analyze the most typical errors in this respect and to recommend how to avoid them in future investigations.

Material and Methods

The main object of genetic investigation in the field of the functional asymmetry is the so-called familial sinistrality (FS), dealing with the non-right handed subjects among the subject's blood relatives.

We worked out in detail a quantitative method of investigation of the FS, based not only on the number of non-right handed subject's blood relatives, but considering their genealogical proximity with him. In majority of the papers on this topic, FS is considered purely qualitatively, i.e., subjects are presented as FS+ and FS-, showing and not showing familial sinistrality. Logically, the problem arises to define the genealogical proximity of relatives, which could be considered in order to determine whether the subject is FS positive or, alternatively, FS negative.

More of thirty papers devoted to familial sinistrality were used as material of the present review article. But only those of them, where the basic principles of the degrees of blood relationships are formulated and those where the most severe errors have been found, were explicitly mentioned and cited in the References. The method was based on analysis of each of the found erroneous approaches through its comparison with the correct approach given in the classic genetic works.

Results and Discussion

First of all, the reviewing of the literature sources showed that some terms in the field of handedness' genealogy need to be unified. For instance, the vast majority of authors include into the term "immediate family" only the subject's parents and siblings [5, 6, 7]. Others include therein parents, siblings, aunts/uncles and grandparents [12]. Third use the expressions "immediate relatives" and "immediate family members" without specifying their meaning [2].

Secondly, as indicated in the Introduction, an astonishing confusion of degrees of relationship is observed. The only correct manner to evaluate the degrees of blood relationship is to count them as consecutive steps from generation to generation. When there is a direct line proband's relative, we count these steps from the proband to his relative in ascendant direction. When a collateral line relative of the subject is concerned, we count the steps from the proband to their common progenitors in ascendant direction and then from the generation of the common progenitors back to the relative in question in descendant direction. Thus, parents and children are the only first degree relatives, while siblings and grandparents are second degree, aunts and uncles are third degree relatives, first cousins are fourth degree relatives, etc. An example is presented in Fig. 1. The proband, III-9, is a female left-hander. Her parents, II-7 and II-8, are her first degree relatives; her grandparents, I-1, 2, 3 and 4, are her second degree relatives, as well as her brother III-10; and all her first cousins, III- 1, 2, 3, 4, 6, 7, 11, 12 and 13, are her relatives of fourth degree.

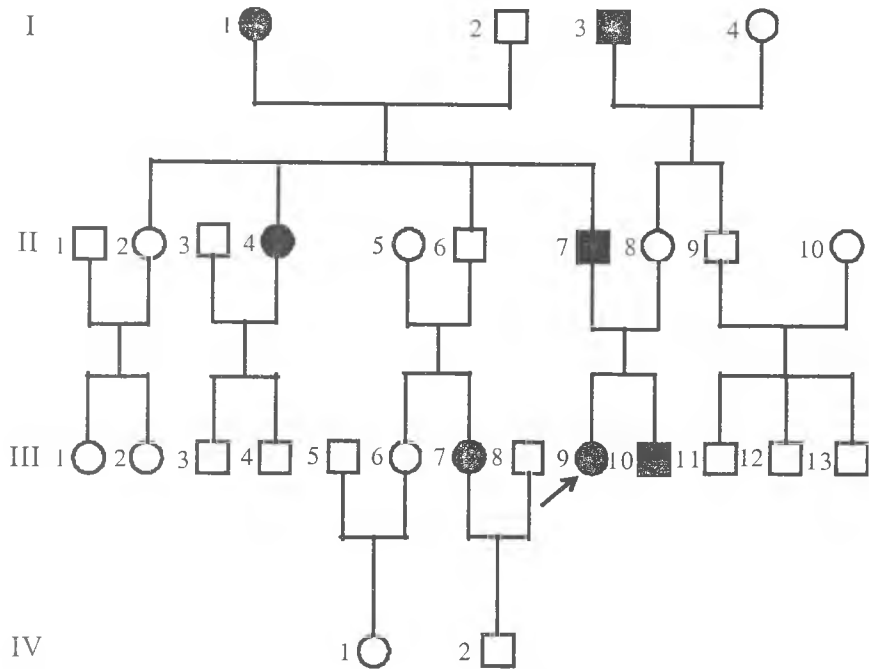


Fig.1. Genealogical tree of one of our subjects – III-9, a left-handed female. The proband is indicated with an arrow and her non-right handed blood relatives are presented by solid symbols

In severe contradiction with these rules, McKeever and VanDeventer [9], McManus [11] and Gorynia and Egenter [4] indicated the siblings, along with parents and children, as first degree relatives. McKeever [8] and McKeever and VanEys [10] enumerated “biologically related aunts and uncles” among the first and second degree relatives. To go the whole way, Salmaso and Longoni [13] and Cobiانchi and Giaquinto [1] included among the first degree relatives grandparents, aunts, uncles and cousins! Truly, in some jurisprudences different systems to evaluate degrees of familial relationships still exist. However, one and only of them, that used in the civil law, is applicable for genetic purposes [3, 14].

Conclusion

Inexcusable genealogical errors are met even in scientific articles. To prevent them, in the course of the medical education much more attention should be paid to (and an expressed emphasis should be put on) genetic methodology. As for the people who have been educated long ago, it is never too late to go through the classic genetic sources.

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