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BIOETHICAL RULES FOR DNA TESTING OF AUTOSOMAL RECESSIVE DEAFNESS 1A IN THE REPUBLIC OF SAKHA (YAKUTIA)

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As a result of studying the bioethical aspects of DNA testing of autosomal recessive deafness-1A (DFNB1A), the main range of bioethical problems that may arise during the mass introduction of DNA testing for hereditary hearing impairment, which in the future will require moral, ethical and legal understanding of the results of the introduction of DNA testing in medical practice was identified. Ethical rules for DFNB1A DNA testing have been developed.

Keywords: autosomal recessive type 1A deafness, DNA diagnostics, bioethics.

Since 2005, the Republic of Sakha (Yakutia) has been conducting a molecular-genetic study of hereditary non-syndromic sensorineural deafness. For the first time in the Yakut population, the molecular-genetic cause of the hereditary congenital form of deafness was identified, which is caused by a mutation in the donor site of the splicing c.-23+1G>A of the GJB2 gene (Cx26) and is classified as an allelic variant of autosomal recessive deafness-1A (DFNB1A) in accordance with the international OMIM catalog (Online Mendelian Inheritance in Man). The prevalence of DFNB1A is 16.2 per 100,000 of the Yakut population, and the frequency of heterozygous carriage of the c.-23+1G>A mutation varies from 3.8% to 11.7% among the indigenous population of Yakutia (Evens, Evenks, Dolgans, Yakuts). The results of the study of the mutation of the GJB2 (Cx26) gene splicing site indicate the existence of the world's largest "endemic focus" of c.-23+1G>A accumulation in Eastern Siberia [1]. We studied the bioethical problems of DFNB1A DNA testing, previously described in an article by Kononova et al. (2018) [2]. As a result of our research, the ethical rules for genetic counseling in the molecular genetic diagnosis of DFNB1A were adopted and approved at a meeting of the local committee on biomedical ethics at the YSC CMP, presented in Table.

Conclusion. As a result of studying the bioethical aspects of DNA testing of autosomal recessive deafness-1A, the main range of bioethical problems that may arise during the mass introduction of DNA testing for hereditary hearing impairment, which in the future will require moral, ethical and legal understanding of the results of the introduction of DNA testing in medical practice, was identified.

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Bioethical rules for DNA testing of autosomal recessive deafness 1A in the RS (Ya)

Bioethical rules	Comments
1. The relationship between the geneticist and the tested individual in genetic counseling is built on mutual trust and is nondirective;	Directivity - a deliberate attempt by a consultant (through deception, threat or coercion) to violate a person's autonomy and push them to a particular decision [4]

2. Every individual who wants to undergo testing has the right to receive complete information about the disease, its development and consequences, the nature of testing, possible results;	To find out the causes of deafness / hearing loss in a family burdened by DFNB1A, patients with different genetic and phenotypic status can apply for genetic counseling: individuals with a normal genotype without hearing impairment ([wt];[wt]), heterozygous carriers with “normal hearing” (c.[mu];[wt]), homozygotes by mutation with severe hearing loss (c.[mut];[mut]). Accordingly, approaches to genetic counseling and obtaining informed consent for DNA testing of these groups of patients should also be different [2].
3. The decision to undergo DNA testing must be voluntary;	Counseling and DNA testing aims to improve psychological well-being and adapt the patient to a genetic condition or risk [4].
4. The presence of a sign language interpreter when consulting patients is mandatory	Information should be communicated to the patient in the most complete and accessible form [4]
5. The necessary condition for conducting DNA testing is informed consent, which means that a capable individual is fully acquainted with the information presented to him, understands it adequately and makes a decision on examination independently	It is necessary to create special conditions for counseling and obtaining informed consent from the deaf. Informed consent to DNA testing of DFNB1A must be in writing and be as accessible as possible. Avoid complex genetic terms and use simple words and sentences [2].
6. DFNB1A DNA testing is acceptable for underage children	Upon receiving informed consent from hearing parents for DFNB1A DNA testing, it can be explained that the child inherits the damaged gene from each parent and, perhaps, some parents will see this as an even distribution of responsibility for the disease. On the other hand, a burdened family history (the presence of deaf relatives in the family) greatly facilitates counseling and obtaining consent for DNA testing, since patients are psychologically ready to accept such hereditary burden in the family. DNA testing of children under 14 years of age for carriage of DFNB1A should be carried out with the informed consent of parents or guardians, and it is very important to inform parents in detail about the genetic status of their child and provide adequate psychological support when reporting the results of DNA testing [2]
7. The patient is given time to think about the decision to undergo DNA testing	Generally, patients are more satisfied if they are adequately informed and actively involved in decision-making. Therefore, it is necessary to respect the patient's choice of consent / rejection of DNA testing [2,4]
8. Information about the results of DNA testing is strictly confidential. Reporting results by mail and phone is not allowed.	Reporting the result of DNA testing about the risk of DFNB1A can carry a significant moral and psychological burden for a person. First, the test taker learns about the risk of having a deaf child in a family. In this case, when heterozygous carriage of DFNB1A is identified in an individual, it is necessary to recommend him prospective medical and genetic counseling or preconception prophylaxis. Secondly, a heterozygous carrier must be provided with information on a rather high risk of hearing loss in old age. The statement of this fact can be supplemented by recommendations for maintaining an appropriate lifestyle and work that would reduce the burden on the organs of hearing (avoid work associated with noise, etc.) [2]
9. The use of DNA diagnostics on DFNB1A for patients with deafness in the Republic of Sakha (Yakutia) can be recommended for prenatal DNA testing procedures, as well as for in vitro fertilization procedures, with the exception of genome editing technology.	The scope of genome editing technology is currently one of the most controversial, as it raises many legal and ethical issues, due to the technical imperfection of genome editing technology:insufficient accuracy and efficiency, mosaicism of the obtained embryos, etc. The absence of long-term observations of the consequences of genome editing technology does not allow us to say with certainty that the modification of the genome will not lead to the development of genomic anomalies in the long term and will not affect the health of offspring in an unpredictable way [3,5].