Hearing loss is one of the most common disorders that occur in childhood, with a frequency of approximately 1/1,000 births. It is divided into acquired (due to environmental factors - infections of the fetus such as toxoplasmosis, rubella, cytomegalovirus), of unknown etiology and genetic/inherited.

Genetic hearing loss can be part of a syndrome (over 400 syndromes include deafness) or non-syndromic, following the three possible types of inheritance: recessive, dominant and X-linked.

Non-syndromic deafness, in particular the form that occurs before the development of lingual communication in children, is in >50% of cases a genetic disease caused by recessive mutations with a high carrier frequency in the general population.

It is important to be able to distinguish between inherited forms of deafness from acquired (non-genetic) forms and this is achieved by a combination of several clinical tests that the expert otolaryngologist will perform together with the necessary genetic tests.

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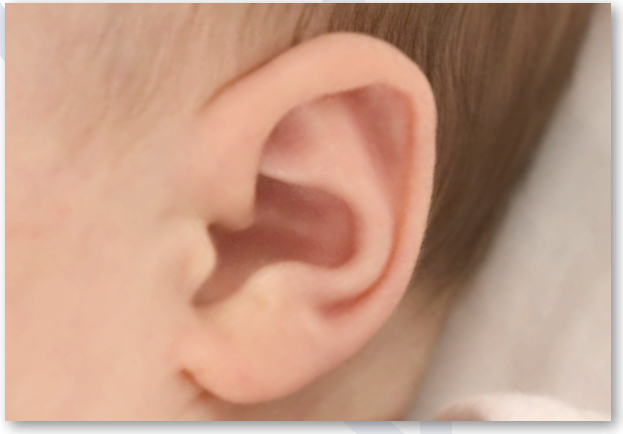
DEAFNESS
GENETIC AND GENOMIC TESTING



- ✓ *up to now, genetic testing was selective, incomplete and costly, involving the investigation of specific targeted genes and often without success*
- ✓ *massive analysis through genomic testing of all known deafness genes leads in a single step to a successful and definitive diagnosis*

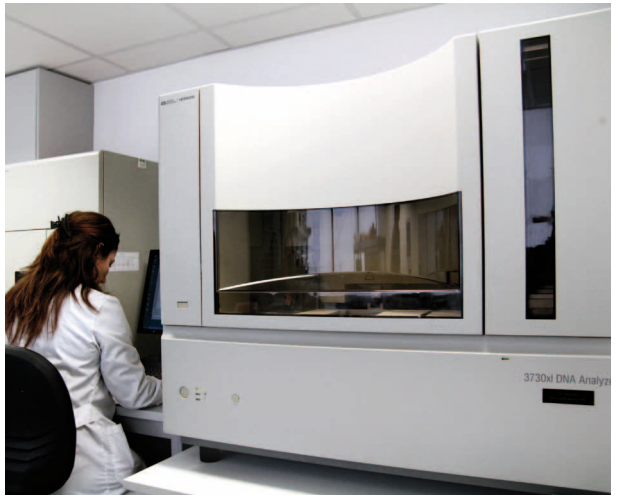
More than 100 genes are estimated to be involved in deafness. However, mutations in only two genes, connexin 26 (GJB2) and connexin 30 (GJB6), represent more than 65% of non-syndromic deafness and about 35% of sporadic forms, with a carrier frequency of 1/33 in the general population. Practically, this means that about 1/7 children suffering from hearing loss generally carry mutations in these two genes. Specifically in the case of connexin 26 (Cx26), the 35delG mutation is detected with a frequency of ~ 90% of all pathological gene mutations and with a carrier frequency in the general population of about 3.5% (1/28 persons).

Genetic testing

Molecular genetic testing of the GJB2 and GJB6 genes is the first and basic test that should be performed in individuals with non-syndromic deafness. Diagnosis is based on the detection of all possible mutations by full DNA sequence analysis (DNA sequencing) of the entire connexin26 (GJB2) gene, coupled to testing for the presence of deletions/duplications involving the connexin 30 (GJB6) gene, thus covering > 99% of mutations in autosomal recessive non-syndromic hearing loss DFNB1.

Genomic testing for deafness – exome sequencing of >80 genes associated with different forms of deafness

In case that initial targeted testing fails to uncover the genetic cause of deafness, today we are in a position to apply in our Centre, massive parallel sequencing of more than 80 genes which have been associated with all known forms of deafness, thus testing for both syndromic and non-syndromic forms of the disease.



How is genomic testing for deafness performed and how long does the test take to be completed

The test is based on the method of next generation sequencing (NGS) and utilizes a special Genome Analyzer instrument together with complex and highly specialized software tools. The test is generally completed within 2-3 months.

Why is genomic testing for deafness useful

Particularly in the case of hearing loss occurring in early childhood, except for medical intervention, early educational intervention is also essential for normal development of speech and language. Moreover, even severe hearing loss can be restored very effectively with hearing aids or cochlear implants. The strategies applied for genetic testing are designed for accurate and efficient identification of the underlying genetic causes, and the results are used for:

1) further understanding of the cause,

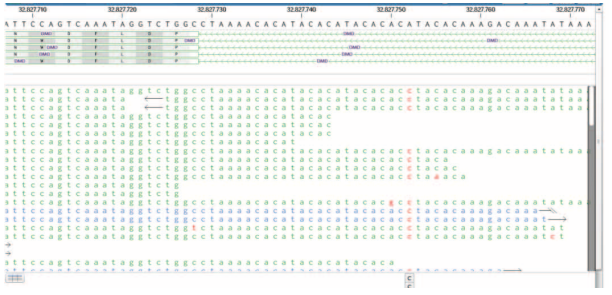
2) prediction of acoustic characteristics,

3) prevention of the disease in the family,

4) managing the symptoms and

5) for determining the appropriate treatment.

The identification of the precise mechanism responsible for the malfunction of the cells in the inner ear through genetic testing undoubtedly facilitates the development and introduction of new and specialized treatments for different types of deafness. Because of these unique characteristics of the disease, genetic testing in hearing loss plays an extremely important role in medical practice and is absolutely essential for definitive diagnosis.



Genetic counseling

Proper clinical genetic assessment of each case and genetic counseling, both before and following the test, is essential in order to determine the appropriate strategy for laboratory testing and to interpret correctly the concepts of pathological and normal.