Molecular Genetics Laboratory, Hospital for Sick Children

Mitochondrial Hearing Loss

Non-syndromic mitochondrial hearing loss is characterized by moderate to profound hearing loss, and a maternally inherited mutation in either the MTRNR1 or MTTS1 gene. Individuals with an MTRNR1 mutation may have a predisposition to aminoglycoside ototoxicity causing deafness and/or late onset sensorineural hearing loss. In these individuals, hearing loss associated with aminoglycoside ototoxicity is bilateral and severe to profound, and occurs within a few days to weeks after administration of any amount of aminoglycoside antibiotic. Individuals with an MTTS1 mutation generally have an onset of sensorineural hearing loss during childhood. Variability in clinical findings may be due to the presence of variable numbers of mitochondria containing mutations in different tissues of the body (heteroplasmy).

Genetics

The MTRNR1 gene encodes the 12S ribosomal RNA and the MTTS1 gene encodes transfer RNA for serine; both are important in mitochondrial protein synthesis. Several recurrent mutations cause nonsyndromic mitochondrial hearing loss, including mutations in the MTRNR1 gene (m.C1494T, m.A1555G, m.961delT+Cn) and MTTS1 gene (m.A7443G, m.G7444A, m.A7445C, m.T7510C, m.T7511C).

Non-syndromic mitochondrial sensorineural hearing loss is due to mutations in mitochondrial DNA (mtDNA) and is transmitted by maternal inheritance. In most cases, the mother of a proband has a disease-causing mtDNA mutation, and may or may not have hearing loss. All offspring of females with a mtDNA mutation are at risk of inheriting the mutation. Offspring of males with a mtDNA mutation are not at risk of inheriting the mutation.

Who Should be Tested?

- Individuals clinically suspected of being affected with non-syndromic mitochondrial hearing loss
- Relatives of probands with identified MTRNR1 or MTTS1 mutations

Potential Outcomes & Interpretation of Test Results

<table>
<thead>
<tr>
<th>Reason for Referral</th>
<th>MTRNR1 / MTTS1 Gene Mutations</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagnosis</td>
<td>None detected</td>
<td>This result does not support a diagnosis of non-syndromic mitochondrial hearing loss</td>
</tr>
<tr>
<td>Diagnosis</td>
<td>Mutation detected</td>
<td>This result supports a diagnosis of non-syndromic mitochondrial hearing loss</td>
</tr>
</tbody>
</table>

For More Information

- MTRNR1 # 561000
- MTTS1 # 590080


The Canadian Association of the Deaf [http://www.cad.ca/](http://www.cad.ca/)

To locate a genetics center near you, please visit the Canadian Association of Genetic Counsellors website at [www.cagc-acgc.ca](http://www.cagc-acgc.ca) or the National Society of Genetic Counsellors website at [www.nsgc.org](http://www.nsgc.org)

SickKids

1. Current molecular testing may not detect all possible mutations for this disorder. A negative test does not rule out the possibility that the individual has a different MTRNR1 or MTTS1 mutation, or a mutation in another gene, not included in the assay and is affected with non-syndromic mitochondrial hearing loss.

2. Low levels of heteroplasmic mutant mitochondria may not be detected by this testing.

3. Test results should be interpreted in the context of clinical findings, family history and other laboratory data.

4. This test was developed and its performance characteristics validated by the Molecular Genetics Laboratory at the Hospital for Sick Children. It has not been cleared or approved by the U.S. Food and Drug Administration. The FDA has determined that such clearance or approval is not necessary. This test is used for clinical purposes.