PATIENT GUIDE

Genetic Testing for Ataxia

A simple guide to understanding ataxia and how genetic testing can help provide answers
What is ataxia?

The word "ataxia" refers to clumsiness or a loss of balance and coordination that is not due to muscle weakness. While there are a number of factors that can cause ataxia, approximately 60-70% of ataxia cases have an underlying genetic cause.\(^1,2\)

A movement disorder specialist can be helpful in determining the exact cause and identify appropriate treatment.
What are the symptoms?

People with ataxia usually have abnormal movements of their fingers, hands, arms, or legs and may have a hard time speaking or moving their eyes. These symptoms can be associated with a variety of disorders, which is why it is important to consult your doctor.

- EYE MOVEMENT ABNORMALITIES
- LACK OF COORDINATION
- TROUBLE EATING AND SWALLOWING
- SLURRED SPEECH
- HEART PROBLEMS
- TREMORS
- DIFFICULTY WALKING AND POOR BALANCE
- GAIT ABNORMALITIES

What causes ataxia?

Many types of hereditary ataxia are caused by nucleotide repeat expansions within the DNA.

A **nucleotide** is a single building block of the DNA. A **repeat** is a group of nucleotides that form a single unit. It is normal for a person to have groups of repeats throughout their DNA that do not cause disease.

A **repeat expansion** is when the number of repeats is greater than the number of repeats in the DNA of average, unaffected people. When the number of repeat units exceeds a certain threshold it can be problematic, causing disease.
A closer look

The DNA of an average, unaffected person

*Less* than a certain threshold of repeat units

The DNA of an affected person that has a repeat expansion

*More* than a certain threshold of repeat units

2 out of 3 people with [hereditary ataxia](#) have a repeat expansion in one of six genes.
Is ataxia genetic?

Sometimes. While certain types of ataxia can occur due to drug interactions, injury to the brain, or environmental exposures, about 66% of ataxia cases have a genetic cause. Genetic, or hereditary ataxia, can be passed down through a family. The genes for ataxia can be one of three types: autosomal dominant, autosomal recessive, or X-linked.

GENETIC MUTATIONS 101

Parents pass along one chromosome of each pair to their children. Pairs 1-22 are autosomes and pair 23 are the sex chromosomes; X and Y. Females have two X chromosomes and males have one X and one Y chromosome.

An autosomal mutation occurs on chromosome pairs 1-22 and is not linked to biological sex, meaning the mutation can affect both males and females.

An X-linked mutation occurs on the X chromosome. Generally, females with an X-linked mutation are carriers and males with an X-linked mutation are affected by X-linked diseases.
Autosomal Dominant

The most common form of ataxia is autosomal dominant ataxia, which occurs when only one copy of a mutated gene is necessary to have the disorder. A parent with autosomal dominant ataxia has a 50% chance of passing the disorder to each child.
**Autosomal Recessive**

An autosomal recessive ataxia occurs when two copies of a mutated gene are necessary to have the disorder. If a person only has one copy of the mutated gene, they are considered a “carrier.”

When both parents are carriers, there is a 25% chance they will have a child with ataxia, a 25% chance the child will be unaffected, and a 50% chance the child will be a carrier.

If only one parent is a carrier and the other parent is not a carrier, there is a 50% chance that they will have a carrier child and 50% chance they will have an unaffected child that does not carry the mutated gene.
X-Linked

The majority of X-linked ataxia affects males only. This occurs when a mother is a carrier, meaning she has one normal copy and one mutated copy of the gene, and she passes the mutated copy of the gene to her son.

Carrier mothers have a 50% chance of passing the mutated gene to their son(s). When the mutated gene is passed to a daughter, she is a carrier.
Types of genetic testing for ataxia

Genetic testing examines DNA to look for changes in the genes that may cause ataxia, and can provide a family with more answers. There are multiple types of tests that can be used to identify genetic ataxia. Providers may choose to order multiple tests at one time or have the tests performed one after the other until a diagnosis is reached.

**REPEAT EXPANSION ANALYSIS**
A single gene analysis that determines if the number of repeats in a certain area of the gene exceeds the threshold commonly observed in unaffected individuals.

**SEQUENCING ANALYSIS**
Reads the letter sequence of a gene looking for changes or “typos” between the typical letter sequence and the affected person. The lab then reviews these changes to decide if they cause ataxia. Sequence tests can be performed on a small number of genes, or a large number of genes, including the entire exome.

- **Targeted phenotypic panels** – Contain single or a few genes associated with a specific condition.
- **Comprehensive panels** – Contain many genes associated with overlapping conditions.
- **Genomic analysis** – Single, duo or trio testing of the exome or the entire genome, with or without the mitochondrial genome.
WHY CONSIDER GENETIC TESTING?

- Confirms the diagnosis of a particular type of ataxia.
- Guides decisions about treatment.
- Provides information about associated neurological or health problems that may occur in the future.
- Aids in decision-making for family planning.
- Allows testing of family members who are at risk of developing ataxia.

Will insurance cover this test?

GeneDx is in-network with most commercial insurance plans. We also offer payment plans and have a Financial Assistance Program for eligible patients. For patients without health insurance, or who choose not to use their health insurance to pay for genetic testing, we offer self-pay pricing and payment plans.

Questions on benefits or payment?

The GeneDx Billing Team can help. Contact them at billing@genedx.com or call (888) 729-1206, option 2.
How does genetic testing work?

1. Gather medical records and family history
2. Healthcare provider or genetic counselor orders test
3. Blood or cheek swab collected and sent to GeneDx
4. GeneDx takes DNA from sample and examines in the lab
5. A report is sent to the healthcare provider

What do the results mean?

There are 3 possible genetic testing results:

**POSITIVE**
A change has been identified in the patient’s DNA that is likely to cause ataxia. The healthcare provider may suggest having family members tested to determine their chance of also having ataxia.

**NEGATIVE**
No changes in the patient’s DNA were found that explain the symptoms of ataxia. It is possible there is a genetic variant not found by this test. The healthcare provider may recommend further testing.

**UNCERTAIN**
The test found a change in the DNA, but it is not known whether the specific change causes ataxia. In this case, the healthcare provider may want to order additional testing for the patient and/or additional family members.
Why do providers prefer GeneDx?

For over 20 years, GeneDx has been a global leader in genomics and genetic testing. The GeneDx team of experts includes hundreds of genetic counselors and MD/PhD scientists with extensive clinical experience and peer-reviewed publications.

We compare every case to our unparalleled GeneDx database that includes over 1 million tests performed, leading to fewer uncertainties and more diagnoses.

To learn more about GeneDx’s genetic testing options, consult a healthcare provider or visit GeneDx.com.

ADDITIONAL RESOURCES

More information is available at the following websites:

National Ataxia Foundation
www.ataxia.org

Genetics Home Reference

MyGeneTeam:
www.mygeneteam.com

National Society of Genetic Counselors, an organization that can help find a counselor near you:
www.nsgc.org

To learn more, visit GeneDx.com/Ataxias

References