

FREQUENTLY ASKED QUESTIONS ABOUT...

Friedreich Ataxia (FRDA)

What is Friedreich ataxia (FRDA)?

Friedreich ataxia (FRDA) is an inherited disease of the central nervous system. It was named after Nikolaus Friedreich, who first described it in 1863, and it was the first form of hereditary ataxia to be distinguished from other forms of ataxia.

What are the symptoms of FRDA?

Difficulty with balance (disequilibrium), impaired coordination of the legs or arms, and thick or slurred speech (dysarthria) are usually the first symptoms of Friedreich ataxia.

Over time, problems with coordination and speech are likely to worsen. Curvature of the spine (kyphoscoliosis) and high arches in the feet (pes cavus) commonly develop. Affected individuals might notice difficulty knowing where their feet or hands are in space (impaired position sense) and they may develop weakness in the legs and hands.

Enlargement of the heart, irregular heartbeat, or other symptoms of heart trouble (cardiomyopathy) occur in many individuals with Friedreich ataxia. Heart problems range from mild to severe. Diabetes mellitus is not uncommon.

Later in the course of the disease about 10 percent of individuals with FRDA have hearing loss, and a similar percentage develop loss of visual acuity or changes in color vision. Another late-stage symptom in about 50 percent of affected people is difficulty with bladder control (incontinence).

What causes FRDA?

Friedreich ataxia is a genetic disorder, which means it is an inherited condition. It is caused by an abnormality of a single gene called the Frataxin, (FXN) gene. The abnormality can be passed from generation to generation by family members who carry it.

Inherited diseases like FRDA occur when one pair of the body's 30,000 genes does not work properly. (Genes are microscopic structures within the cells of our bodies that contain instructions for every feature we inherit from our parents. Two copies of each gene are inherited, one copy from the mother and one from the father.)

FRDA is autosomal recessive, which means that an individual only develops symptoms of the disease if both copies of his or her frataxin gene are not working properly. An individual who has one copy of an altered or nonfunctioning FXN gene does not develop any neurologic symptoms and is called a carrier. In people who are carriers, the normal frataxin gene compensates for the nonfunctioning copy of the gene. However, a child whose parents are both carriers can inherit a "double dose" of the altered FXN gene and will therefore develop FRDA.

Most of the time carriers have no idea that they have an abnormal FXN gene because there are no symptoms or medical problems that go along with being a carrier. It is often only when a child is diagnosed with FRDA that the parents learn they are both carriers. When both parents are carriers, each of their children has a 25 percent chance of having FRDA and a 50 percent chance of being a carrier. The illustration on the next page shows how an autosomal recessive disorder like Friedreich ataxia can be passed on.

HOW AN AUTOSOMAL RECESSIVE DISORDER IS PASSED ON IN A FAMILY

When both parents are carriers, each of their children has a 25 percent chance of having FRDA and a 50 percent chance of being a carrier.

FATHER WITH ONE **F** AND ONE **f**
(DOES NOT HAVE FRDA)



MOTHER WITH ONE **f** AND ONE **F**
(DOES NOT HAVE FRDA)



F = normal gene
f = disease gene

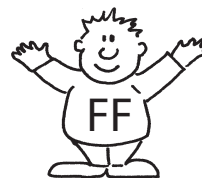
The above parents each have one recessive FRDA-causing gene. Each of their offspring could inherit one of four possible gene combinations:



F from father, **f** from mother
(child doesn't have FRDA but can pass disease gene on to future children)



f from father, **F** from mother
(child doesn't have FRDA but can pass disease gene on to future children)



F from father, **F** from mother
(child doesn't have FRDA and has no disease gene to pass on to future children)



f from father, **f** from mother
(child will have FRDA and will pass disease gene on to all future children)

When do FRDA symptoms appear?

Males and females are equally likely to inherit the genes that cause FRDA. Symptoms usually begin between ages five and 25 but occasionally appear in younger children or adults in their 30s or 40s.

How common is FRDA?

FRDA is the most common form of childhood onset ataxia. In the United States it is estimated that about 1 in 100 people is a carrier of the altered FXN gene and one out of every 20,000 to 50,000 is affected with Friedreich ataxia. In some regions or ethnic groups this number might be a little higher or lower.

How is the diagnosis made?

When symptoms resembling those of FRDA appear it is important to receive a thorough medical evaluation by a neurologist. Generally, an evaluation will involve a physical exam and tests to search for abnormalities in the brain and spinal cord. Many of these tests are done to rule out other possible causes of symptoms. (Other possible causes might include nutritional deficiencies, infections, multiple sclerosis, herniated disk in the neck, stroke, brain and spinal cord tumors, and other degenerative diseases.)

Since the discovery of the FXN gene in 1996, it has been possible to make a specific diagnosis of FRDA by a gene test. In almost all cases, scientists are able to identify the abnormality in the frataxin gene that causes FRDA. The FXN gene is responsible for directing the production of the frataxin protein, which is one of the thousands of proteins needed for the body to function properly. Levels of frataxin in the spinal cord and brain are much lower than normal in individuals with FRDA. However, it is more practical to test the FXN gene in blood cells than to measure frataxin protein levels in the nervous system.

Diagnosis of FRDA is made by genetic testing. In individuals with the typical clinical course, ancillary testing (EMG, MRI, CT) is unnecessary, though it may be useful in atypical patients. Appropriate specialists may be consulted such as a heart specialist, ophthalmologist, audiologist (hearing specialist), orthopedist (bone doctor), urologist, or endocrinologist (diabetes).

What happens after the diagnosis?

It is helpful for patients and families with FRDA to undergo genetic counseling since they typically have questions about the chances that other family

members will acquire the disease or be carriers of the abnormal FXN gene. Questions about genetic testing can also be answered by a genetic counselor. An individual with FRDA should find a physician who will follow him or her on a regular basis to help address the neurologic changes that are likely to occur over the course of the disease, to anticipate and screen for possible complications (such as diabetes and heart disease), and to make appropriate referrals to other specialists as needed, including physical, occupational or speech therapists.

What kind of support is available for people with FRDA and their families?

Before and after the diagnosis, psychological counseling or participation in support groups is often beneficial for the affected person and family members. Symptoms of FRDA are often similar to those of other forms of ataxia and there are numerous ataxia support groups throughout the United States.

People with Friedreich ataxia are welcome to participate in any of the support groups affiliated with the National Ataxia Foundation. Support groups throughout the United States can be found on the National Ataxia Foundation's web site: www.ataxia.org.

What type of research is being done on FRDA?

The National Ataxia Foundation funds promising world-wide research in all the types of ataxias including Friedreich ataxia.

How can I participate in research?

Because of a better understanding of the disease mechanism of Friedreich ataxia, there are often opportunities for patients with Friedreich ataxia to participate in research. The National Ataxia Foundation has partnered with the Coordination of Rare Diseases at Sanford (CoRDS) national rare disease registry to host a patient registry for individuals diagnosed with all forms of ataxia. Individuals who are undiagnosed but at risk for ataxia are also eligible to enroll. The CoRDS is a web-based secure patient registry that serves as an important tool to match patients with any type of ataxia to researchers who need human subjects to participate in their research. Even if you are enrolled in another patient registry, you are encouraged to enroll in the CoRDS Registry by going to: <https://www.sanfordresearch.org/CoRDS/CoRD-RegistryForm/>

Additional patient registries and research opportunities can be found at this page of NAF’s website: <http://www.ataxia.org/research/patient-registry.aspx>

A complete listing of publicly and privately supported clinical studies on a wide range of diseases and conditions, including Friedreich ataxia, can be found at www.ClinicalTrials.gov which is a web-based resource that provides patients, their family members, health care professionals, researchers, and the public with easy access to information.

What is the National Ataxia Foundation?

The National Ataxia Foundation is committed to education about ataxia, service to individuals affected with all forms of ataxia and promoting and funding research to find the causes, better treatments and a cure for ataxia. For questions regarding on-going research, clinical trials or other information about FRDA, contact the National Ataxia Foundation.

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Advancements in scientific research in the ataxias are on-going, as well as new discoveries. Therefore, some information on this fact sheet may not be the most current information available.