



# My46 Trait Profile

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## Myoclonic Epilepsy associated with Ragged Red Fibers

*Mitochondria are small organelles that exist in every cell of the body. They are like the powerhouse of the cells and produce the energy our bodies need to function. Symptoms of mitochondrial disease are usually most present in the organs that require the most energy like the muscles, brain, and heart. Myoclonic Epilepsy associated with Ragged Red Fibers is a mitochondrial disorder that can cause progressive muscle weakness and neurological problems. It is most commonly caused by a mutation in the MT-TK gene that makes a mitochondrial transfer RNA molecule.*

### Characteristics of Myoclonic Epilepsy associated with Ragged Red Fibers

The first symptom of Myoclonic Epilepsy associated with Ragged Red Fibers (MERRF) is often muscle spasms known as myoclonus. This may be in the form of myoclonic jerks or myoclonic seizures. Over time, the symptoms progress to recurrent seizures (epilepsy), difficulty walking (ataxia), muscle weakness, and progressive cognitive decline (dementia). Other features may include hearing or vision loss, difficulty gaining weight, and problems with the muscles or electrical impulses of the heart (cardiomyopathy and conduction defects). The features of MERRF often develop in late childhood. The signs and symptoms of MERRF are highly variable within families as well as between other unrelated, affected individuals. The symptoms may be very mild or very severe. MERRF is considered a progressive condition where symptoms tend to worsen over time. The “ragged red fibers” in MERRF refer to the abnormal muscle cells when viewed under a microscope using a special type of staining.

### Diagnosis/Testing

MERRF is caused by a change or mutation in the mitochondrial DNA. There are two sets of genetic material in the body: mitochondrial DNA (mtDNA) and nuclear DNA. Mitochondrial DNA (mtDNA) tells the mitochondria how to function. Nuclear DNA also helps with mitochondrial function, but also codes for instructions for the rest of the body. MERRF is commonly caused by a single mutation (m.8344A>G) in the mitochondrial gene MT-TK, but it can also be caused by other changes in the mtDNA. A healthcare provider may order genetic testing for MERRF if there is a family history of the condition or if an individual has symptoms that seem like they could be due to MERRF.

### Management/Surveillance

Individuals with MERRF have seizures that need to be managed by a neurologist. There are a variety of medications used to control seizures, however it is recommended that valproic acid, a medication often prescribed for seizure management, be avoided in individuals with MERRF. Individuals with MERRF should have regular vision and hearing screenings, as both can decrease over time. Individuals with mitochondrial disease are at increased risk for heart problems, and should be regularly evaluated by a cardiologist. Individuals with mitochondrial disease may have increased symptoms of their disease during times of illness, especially when they are vomiting or not eating or drinking well. Periods of long illness require immediate medical attention. Individuals with MERRF should also inform their providers if they are undergoing surgery or a medical procedure that requires them to fast, as this can also worsen symptoms.

Children and adolescents with MERRF may need accommodations at school that address learning problems, medical concerns, and mobility problems.

Individuals with MERRF may need services such as physical, occupational, or speech therapy. It is important that

healthcare providers monitor individuals with MELAS syndrome on a regular basis for disease progression. Many individuals with MERRF take a vitamin compound with coenzyme Q10 and other vitamins that may increase the mitochondria's ability to produce energy.

### **Mode of inheritance**

Mitochondria are structures inside the cells that are responsible for generating the energy that is needed to perform daily activities. Humans also carry DNA in mitochondria, and mutations in mtDNA can result in MERRF.

Humans inherit mitochondria only from their mothers. Therefore, in maternal mitochondrial inheritance, the affected mitochondria are passed from mothers (who may or may not show symptoms) to children of either sex. Because males do not transmit mitochondria, a male with a maternal mitochondrial disorder generally cannot pass it to his children. Mitochondrial DNA mutations can also occur brand new (de novo) in an affected individual. When de novo, parents and siblings of an affected person are not at increased risk, but if the affected person is a female, her children are at increased risk.

Inside each cell, there is a mixture of mutated mtDNA and normal mtDNA. Symptoms are more likely when the mixture contains more mutated mtDNA. The number of mitochondria with mutated versus a normal mtDNA is variable across different body tissues (blood, brain, heart, skin, hair, etc.). Moreover, the number of mutated versus normal mtDNA can change dramatically when passed from mothers to their children.

### **Risk to family members**

Maternal mitochondrial inheritance is associated with a significant degree of variability. Because of this remarkable variability, it can be difficult to provide inheritance risk estimates for people with a maternal mitochondrial condition; however specific information may be available depending on the identified mtDNA mutation. Mothers of individuals with MERRF usually have the mtDNA mutation, and thus all siblings of the individual with MERRF also have the mtDNA mutation. The exact risk for these individuals to develop symptoms is unknown.

### **Special considerations**

None

### **Resources**

MitoAction

<http://www.mitoaction.org>

United Mitochondrial Disease Foundation

<http://www.umdf.org/site/c.8qKOJ0MvF7LUG/b.7929671/k.BDF0/Home.htm>

Genetics Home Reference: Myoclonic epilepsy with ragged-red fibers

<http://ghr.nlm.nih.gov/condition/myoclonic-epilepsy-with-ragged-red-fibers>

### **References**

[Davis, RL. et al. \(2011\).](#) "The Genetics of Mitochondrial Disease." *Seminars in Neurology* 31(5): 519-530.

DiMauro S, Hirano M. (Updated 18 August 2009). MERRF. In: GeneReviews at GeneTests Medical Genetics Information Resource (database online). Copyright, University of Washington, Seattle. 1997-2013. Available at <http://www.ncbi.nlm.nih.gov/books/NBK1520/>. Accessed [10/11/2013].

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