MECP2 duplication syndrome
This guide is not meant to take the place of medical advice.

Please consult with your doctor about your genetic results and health care choices. The information in this guide was up to date at the time it was written in 2020. But new information may come to light with new research. You may find it helpful to share this guide with friends and family members or doctors and teachers of the person who has MECP2 duplication syndrome.
What is MECP2 duplication syndrome?

MECP2 duplication syndrome happens when someone has an extra piece of the MECP2 gene. This change can keep the gene from working as it should.

The syndrome can also happen when larger segments of DNA are duplicated. Then it is known as Xq28 duplication syndrome.

A different MECP2-related syndrome called Rett syndrome happens when a piece of the MECP2 gene is missing. This change can also keep the gene from working as it should. Many people who have Rett syndrome have severe impairments in speech, movement, and breathing.

Key role
The MECP2 gene plays a key role in brain development and the function of brain cells. It is also important for the immune system.

Symptoms
Because the MECP2 gene is important in the development and function of brain cells, many people who have MECP2 duplication syndrome have:

- Low muscle tone
- Delayed motor development
- Intellectual disability
- Little to no speech
- Spasticity, a condition in which muscles are continuously contracted
- Frequent respiratory infections
- Seizures
- Features of autism
What causes MECP2 duplication syndrome?

Our genes contain the instructions, or code, that tell our cells how to grow, develop, and work. Genes are arranged in structures in our cells called chromosomes. Chromosomes and genes usually come in pairs, with one copy from the mother, from the egg, and one copy from the father, from the sperm.

We each have 23 pairs of chromosomes. One pair, called the X and Y chromosomes, differs between biological males and biological females. Biological females have two copies of the X chromosome and all its genes, one from their mother and one from their father. Biological males have one copy of the X chromosome and all its genes, from their mother, and one copy of the Y chromosome and its genes, from their father.

In most cases, parents pass on exact copies of the gene to their child. But the process of copying genes is not perfect. A change in the genetic code can lead to physical issues, developmental issues, or both.
The MECP2 gene is located on the X chromosome, so changes in this gene can affect biological males and biological females in different ways. Biological males who have an extra piece of this gene will likely have MECP2 duplication syndrome.

Biological females who have one working copy of the gene and one non-working copy of the gene are called ‘carriers’. This means that they may not have signs or symptoms of the syndrome, but they can pass it along to their children.

Research shows that MECP2 duplication syndrome is usually inherited. In other cases, it results from a random change in the sperm or egg during development. Parts of the chromosomes can break off, make extra copies, or end up in a different order than expected. When this happens, it is called a ‘de novo’, or new, change. The child can be the first in the family to have the gene change.
Why does my child or I have a change in the MECP2 gene?

No parent causes their child’s MECP2 duplication syndrome. We know this because no parent has any control over the gene changes that they do or do not pass on to their children. Please keep in mind that nothing a parent does before or during the pregnancy causes this to happen. The gene change takes place on its own and cannot be predicted or stopped.
What are the chances that other family members or future children will have MECP2 duplication syndrome?

Each family is different. A geneticist or genetic counselor can give you advice on the chance that this will happen again in your family.

The risk of having another child who has MECP2 duplication is almost always 25 percent, but it also depends on the genes of both birth parents.

- Biological females who have extra copies of the MECP2 gene and are pregnant with a daughter have a 50 percent chance of passing on the extra copies and a 50 percent chance of passing on the working copy of the gene. If they are pregnant with a son, the child has a 50 percent chance of inheriting the extra copies and the syndrome.

For a symptom-free sister of someone who has MECP2 duplication syndrome, the risk of having a child who has the syndrome depends on the symptom-free sibling’s genes and their parents’ genes.

- If neither parent has the same gene change found in their child who has the syndrome, the symptom-free sister has a nearly 0 percent chance of having a child who has MECP2 duplication syndrome.

- If the mother has the same gene change found in her child who has the syndrome, the symptom-free sister has a small chance of also having the same gene change. If the symptom-free sister has the same gene change as their sibling who has the syndrome, the symptom-free sibling’s chance of having a son who has MECP2 duplication syndrome is 50 percent.

For a person who has MECP2 duplication syndrome, the risk of having a child who has the syndrome is about 50 percent.
How many people have MECP2 duplication syndrome?

As of 2020, doctors had described about 176 people in the world with extra copies of the MECP2 gene. The first case of MECP2 duplication syndrome was described in 2005. Scientists expect to find more people who have the syndrome as access to genetic testing improves.

Do people who have MECP2 duplication syndrome look different?

People who have MECP2 duplication syndrome may look different. Appearance can vary and can include some but not all of these features:

- Flat back of the head, also known as brachycephaly
- Eyes that do not look in the same direction at the same time, also known as strabismus
How is MECP2 duplication syndrome treated?

Scientists and doctors have only just begun to study MECP2 duplication syndrome. At this point, there are no medicines designed to treat the syndrome. A genetic diagnosis can help people decide on the best way to track the condition and manage therapies. Doctors can refer people to specialists for:

- Physical exams and brain studies
- Genetics consults
- Development and behavior studies
- Other issues, as needed

A developmental pediatrician, neurologist, or psychologist can follow progress over time and can help:

- Suggest the right therapies. This can include physical, occupational, speech, or behavioral therapy.
- Guide individualized education plans (IEPs).

Specialists advise that therapies for MECP2 duplication syndrome should begin as early as possible, ideally before a child begins school.

If seizures happen, consult a neurologist. There are many types of seizures, and not all types are easy to spot. To learn more, you can refer to resources such as the Epilepsy Foundation's website: epilepsy.com/learn/types-seizures.
MECP2 duplication syndrome is very rare. Doctors and scientists have not been studying this condition very long. As of 2020, studies had described about 176 people who have MECP2 duplication syndrome.

This section includes a summary of information from major published articles. It highlights how many people have different symptoms. To learn more about the articles, see the Sources and references section of this guide.

Behavior and development concerns linked to MECP2 duplication syndrome

Learning
Nearly everyone who has the syndrome has moderate to severe intellectual disability and developmental delay.

Speech
Most people who have MECP2 duplication syndrome do not speak.

Behavior
Most people who have the syndrome have repetitive hand movements.

Some have autism or features of autism.

Mental health
One study found that 29% (14/48) have anxiety, and 58% (28/48) have irritability.
Medical and physical concerns linked to MECP2 duplication syndrome

Brain
About one-half of people who have MECP2 duplication syndrome will experience seizures. These seizures usually involve the entire body, a seizure type known as generalized tonic-clonic. Seizures can also be atonic, a type of seizure in which there is a sudden loss of muscle tone, or absence, seizures with brief staring spells. Seizures start by about age 6 in most people.

Muscle tone
Most infants who have MECP2 duplication syndrome have very low muscle tone. In 75 percent of males who have MECP2 duplication syndrome, low muscle tone leads to overly tight or flexed muscles, a condition called spasticity, in childhood. The spasticity is most noticeable in the legs.

Feeding and digestion issues
As a result of low muscle tone, children who have MECP2 duplication syndrome often have feeding difficulties, especially during early life. Some need a feeding tube. In one study, 61 percent (34/56) had early feeding difficulties, 78 percent (43/55) had constipation, and 67 percent (34/51) had reflux.
Medical and physical concerns linked to MECP2 duplication syndrome

**Sitting and walking**
Due to low muscle tone, most children who have MECP2 duplication syndrome are **late in sitting, crawling, and walking**. Some people have issues with **balance and coordination**. About one-third of people cannot walk independently and **may need a wheelchair**.

**Other medical concerns**
Studies suggest that up to 75 percent of people who have MECP2 duplication syndrome have frequent respiratory infections, especially pneumonia. About 88 percent do not lose their baby teeth naturally, and so they may require extraction. About 70 percent grind their teeth.

- **75%** have frequent respiratory infections
- **88%** do not lose their baby teeth
- **70%** grind their teeth

**Joints and spine**
According to one study, 53 percent (23/43) have a curved spine, also called **scoliosis**.

**Eyes and eyesight**
In one study, 76 percent had **strabismus**, or eyes that do not look in the same direction at the same time.
Where can I find support and resources?

**MECP2 duplication Facebook groups**

www.facebook.com/groups/mecp2families

www.facebook.com/groups/319013378142233

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**MECP2 Duplication Foundation**

https://mecp2d.org
Sources and References

The content in this guide comes from published studies about MECP2 duplication syndrome. Below you can find details about each study, as well as links to summaries or, in some cases, the full article.


- Miguet M. et al. *Journal of Medical Genetics*, 55, 359-371, (2018). Further delineation of the MECP2 duplication syndrome phenotype in 59 French male patients, with a particular focus on morphological and neurological features. [jmg.bmj.com/content/55/6/359.long](jmg.bmj.com/content/55/6/359.long)

