Testing for mosaicism

Mosaicism can sometimes be identified during a standard genetic test. Other times, further genetic testing can be carried out if mosaicism is suspected. Scientists can also detect possible mosaicism by reanalysing existing genetic test results.

The most commonly used tests to identify mosaicism are microarray tests (to identify chromosomal deletions and duplications) or sequencing (to identify changes to the genetic code of genes). Other tests, such as karyotyping or FISH, can also be used for whole chromosome or structural changes. The presence of a mosaic genetic change will be indicated by the mention of 'mos' in a genetic test results description. Typically, an estimate of the percentage of cells that contain the genetic change will be provided.

Unique publishes separate guides for arrayCGH, SNParray, sequencing and FISH.

Somatic mosaicism test samples

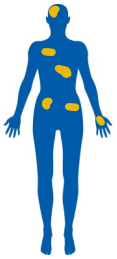
Most standard genetic tests that can identify mosaicism are carried out on cells found in blood samples, saliva or cheek swabs (buccal mucosa). It is sometimes preferable to test other cell types, for example those found in a skin sample. However, the results of these tests will only identify if the genetic variant is present, and if mosaicism exists, in those particular cells. A challenge of this is that the most significant organs, such as the brain or heart, are not easily accessible for testing.

Germline mosaicism test samples

A genetic test that could identify germline mosaicism is currently only offered for sperm samples in a research setting. Germline mosaicism is not tested in eggs due to the complications of sample collection.

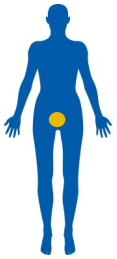
Since it is not possible to test for mosaicism in all cells, it is not always possible to detect mosaicism even though it may be present. Some tests are more sensitive than others, and very low level mosaicism, when a genetic variant is only found in a few cells, can easily be missed.

Brief definition of mosaicism



Somatic Mosaicism

A genetic change is found in some cells of the body, but not in the egg or sperm cells. A person with somatic mosaicism may or may not be affected depending on how many and which cells contain the change. The change would not be passed on to children since it is not present in egg or sperm cells.



Germline Mosaicism

A genetic change is in either the egg or sperm cells, but not in other cells of the body. A person with germline mosaicism will not be affected but can pass on the variant to a child who is likely to be affected.

It is possible to have both somatic and germline mosaicism.

Inform Network Support

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Join Unique for family links, information and support.
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Understanding Chromosome & Gene Disorders

Mosaicism

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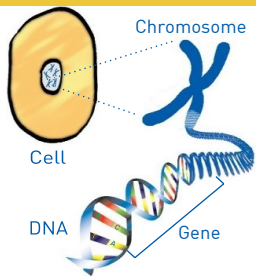
What is mosaicism?

In genetics, the term mosaicism describes a condition in which a genetic change is found in some, but not all, of the body's cells.

What is a genetic change?



We use the word genetic when we talk about our genes, DNA or chromosomes. A genetic change (sometimes called a variant) is a change to our DNA, gene or chromosomes.

Our bodies are made from many different types of cells, almost all of which contain our chromosomes. Chromosomes are made from long stretches of DNA. DNA can be described as a sequence of letters that code for our genes and other important genetic information.

We all have many different genetic changes. Some are passed on by our parents, these are known as inherited changes. Some happen for the first time in a family member, these are called *de novo* changes. *De novo* changes can occur in an egg or sperm cell, or at any stage after these two cells join. These changes happen by chance and are not due to anything either parent did before or during pregnancy. It's only when an important gene or genes are involved that health and development can be affected.

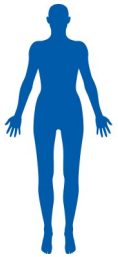
Most genetic changes are benign, which means they are not known to cause symptoms or features of medical or developmental concern. However, some changes are pathogenic, which means they are associated with symptoms and features that could be of concern for our health, growth, development and function.

There are many different types of genetic changes. It could be that the genetic code of a gene or important piece of DNA has been changed. A section of a chromosome could be missing (known as a deletion) or duplicated. It could also be that an entire chromosome is missing or duplicated. Chromosomes can also form a different shape, or swap sections with other chromosomes.

Types of mosaicism

There are basically two types of genetic mosaicism. One is called somatic mosaicism and involves any cells of the body, other than the sperm or egg cells. The other is called germline mosaicism (also known as gonadal mosaicism) and affects only our 'reproductive' cells i.e. our egg or sperm cells (also known as germline cells).

Somatic mosaicism

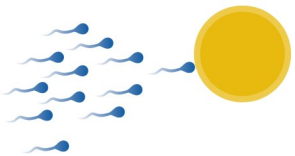


A somatic cell is any cell of our body, apart from our egg and sperm cells. So, somatic mosaicism refers to a genetic change that occurs in any cell of our body, and is not expected to be in egg or sperm cells. It means that not all cells of our bodies have exactly the same DNA; some cells will have the genetic change and some will not.

After an egg and sperm cell come together at conception, a single cell is formed. This cell, and each subsequent cell, must then divide in order to produce the trillions of cells that make up our bodies. Each time a cell divides, the genetic information (chromosomes) contained within must be copied and placed in a new cell. During this complicated biological process, genetic changes can occur that are then copied into all descendant cells. This can happen at any time in our lives, either when we are developing in our mother's womb or after birth.

If a genetic change occurs during early development, it is more likely that a greater number of cells will be affected (this is called constitutional mosaicism). If a change occurs later in our lives, it's likely that only a specific area of the body or a specific organ will be affected (this is called confined mosaicism).

Germline mosaicism



Germline mosaicism involves only egg or sperm cells. If germline mosaicism is identified or suspected, it means some egg or sperm cells carry, or are thought to carry, a specific genetic change.

How can mosaicism affect us?

How a person could be affected by mosaicism depends on whether they have somatic and/or germline mosaicism. Somatic mosaicism can affect our health and development whereas germline mosaicism can mean that we can pass on the genetic change to our children.

Effects of somatic mosaicism

Somatic mosaicism is very common. In fact, since we all carry thousands of benign genetic changes, we could all be considered as having somatic mosaicism. It's only when pathogenic changes are involved that we need to consider which and how many cells of our body are affected, as well as the exact genetic change.

For example, having a pathogenic genetic change in cells of the brain, could have a very different effect to having the same genetic change in cells of the skin.

Somatic mosaicism, in which only a small number of cells are affected, may not result in any noticeable symptoms or features. When a lot of cells are affected, clinically significant symptoms and features can occur. The level of mosaicism can be different in different cells and will be different in different people.

It is generally considered that people who have mosaicism, for a specific genetic change, are less severely affected than those who have the change in all cells of their body.

It is also possible to have somatic mosaicism and germline mosaicism.

Effects of germline mosaicism

Germline mosaicism is more rare. If someone has germline mosaicism, without somatic mosaicism, they are likely to be unaware of it until they experience more than one pregnancy, or have more than one child, with the same genetic change that neither parent was found to have following a standard genetic test.

If a parent has germline mosaicism for a pathogenic genetic change, they will not have any clinical symptoms or features since none of their somatic cells are affected. Each pregnancy however will carry a risk of passing the genetic change on to the child. The child will have the genetic change in all of their cells and are likely to have some health and/or developmental concerns.