**Saint Mary's Hospital**
**Manchester Centre for Genomic Medicine**

## Information for Patients

# A Guide to Multifactorial Inheritance

## What are genes?

Genes are the unique set of instructions inside our bodies which make each of us an individual. We have many thousands of genes, each carrying a different instruction. If a gene is altered, it can cause a genetic condition or disease.

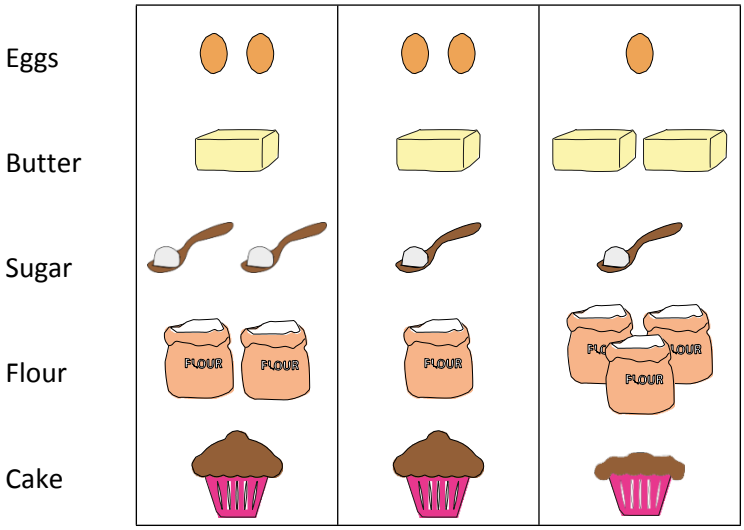
We have two copies of each gene. One copy is inherited from each of our parents. When we have children, we pass on only one copy of each of our genes.

## What is 'multifactorial inheritance'?

Some genetic conditions are caused by an alteration in a single gene (e.g. Cystic Fibrosis). However, many other conditions are caused by problems with the complex interaction between one or more genes, acting together with non-genetic factors (such as diet and lifestyle). This is referred to as multifactorial inheritance. In these conditions, alterations in one or more genes may increase or decrease a person's susceptibility to a condition. The condition will not occur unless other non-genetic factors are also unfavourable. In other words, the condition has no single 'cause'; a combination of genetic and non-genetic factors have come together and resulted in the condition.

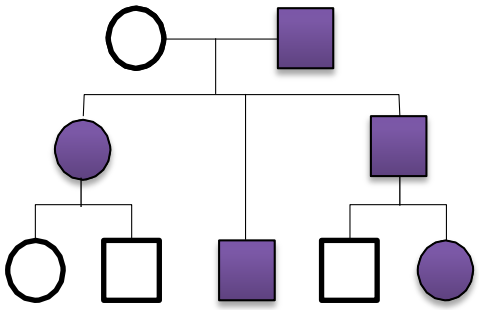
Multifactorial inheritance can be thought of as a recipe. If the amount of one ingredient is changed slightly, the recipe may still work.

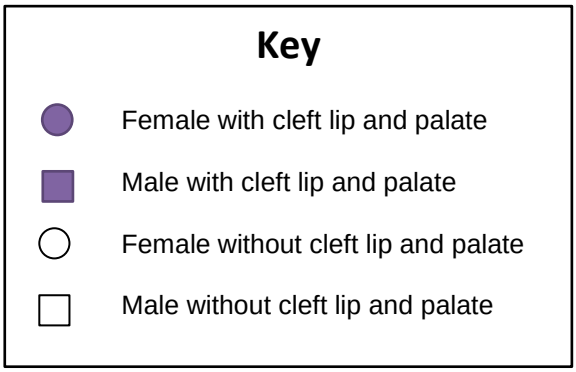
However, if the amounts of several ingredients are changed, the recipe may not work as expected:



## Having children

Conditions caused by multifactorial inheritance can run in families, but the occurrence does not follow a regular pattern. Although several members of a family may be affected, they can be linked to each other by relatives who do not have the condition. This is shown in the family below where the shaded individuals have a cleft lip and palate:






It is often difficult to identify all the factors that contribute to a multifactorial condition so it can be difficult to accurately estimate the chance that it may occur again in a particular family. Usually, these estimates are based on research looking at how often the condition has happened again in large numbers of families.

In general, the more affected individuals there are in the family and the more closely they are related to the person who wants to know if they may have an affected child, the higher the chance of a baby being affected. The risks are also higher if those individuals with the condition in the family have been severely affected.

The chances will therefore vary for each family. In general, if only one relative has been affected the risk is likely to be low. For example if a person has had one child with a cleft lip and palate but no other family members are affected, then the risk for another pregnancy is 4%. If, however, both a parent and a child are affected, the risk of having another affected child is 10%.

## Genetic testing

In general, genetic testing cannot be offered for multifactorial conditions.

Sometimes genetic tests can be offered to make sure that the condition has not been caused by an alteration in a single gene, or to look for gene alterations that are known to significantly increase the risk.

## Pregnancy

It is not usually possible to carry out genetic testing for a multifactorial condition in pregnancy. Tests such as detailed ultrasound scans can sometimes be used to look for the condition in question (for example to see if there is a cleft lip). For some multifactorial

conditions, the risk can be lowered by altering the non-genetic factors involved (such as taking folic acid before and during pregnancy to reduce the chance of spina bifida).

## Research

For many conditions with multifactorial inheritance, research is in progress to attempt to identify all the genetic and non-genetic factors. It is hoped that this will lead to a better understanding of how to reduce the risks, as well as increasing the number of tests that are available.

## For more information

If you need more advice about any aspect of Multifactorial Inheritance, you are welcome to contact:

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Seen in clinic by (doctor): _____

And (Genetic Counsellor): _____

Telephone number: _____

Family reference number: _____