Factsheet

Genes and MS

Genes play a part in MS, but they are not the whole story.

What is a gene?
Genes are instructions for our bodies, a code passed on from our parents that influences the characteristics we will have - our height, hair colour and eye colour, for example.

Genes can also affect our chances of developing certain health conditions, including MS.

Is MS in my genes?
Yes and no. There is a genetic element to MS, but it is only part of the story.

MS is not passed on directly from parents to their children. Even identical twins (who have identical genes) are not likely to both get MS. If one does, there is around a 70 per cent chance that the other will not. If genes on their own caused MS, both identical twins would get MS.

But family members of someone with MS are more likely than the general population to develop MS themselves. See 'MS in the family - what are the chances?' on page 2 for more.

More than just genes
So there is more to MS than just the genes. Although we don't yet know exactly what causes MS, it is believed to be a mixture of genes and other influences - known as 'environmental factors'.

Genes and MS © MS Society 2013
Possible environmental factors include common viruses, bacterial infections and vitamin D deficiency.

A test for MS genes?
There is no reliable genetic test that can tell us who will develop MS.

There are several reasons for this:

- There is no single 'MS gene'. Research suggests that more than 50 different genes are likely to play a part in the development of MS.
- The genes that have been identified are very common. Most people who have these genes do not have MS.
- Each individual gene only has a tiny influence on the overall risk of getting MS.
- The combination of genes and environmental factors is very complex. So knowing if you have a particular gene, or combination of genes, cannot tell you if you will definitely get MS.

MS in the family - what are the chances?

We all share some genes with our blood relatives. The closer the relation, the more genes we have in common.

A brother or sister is most genetically similar to us - each of us has half the genes of the mother and half of the father. We share fewer genes with grandparents, and even fewer with cousins.

Remember - while MS can occur more than once in a family, it's more likely that this won't happen. There are many factors affecting a person's risk for any health condition, many of which we cannot know about or control. For example, risks might vary in different places, at different times, and according to what happens in someone's life.

Some figures
In the UK, around one person in every 600 gets MS. This is much, much less than a one per cent chance.
By looking at several different studies from around the world, researchers can also give an idea of the chances for relatives developing the condition:

- If a parent has MS: about a two per cent chance
- If a brother or sister has MS: about a five per cent chance
- If an identical twin has MS: about a 30 per cent chance

So, for people with a family member with MS, there is a higher risk than for the population as a whole. But even for the closest of relatives there's still a much greater chance that a person will not develop MS.

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**What has research discovered?**

Research has already discovered several key things about genes and MS:

- **Many genes are involved**
  There are lots of genes involved in MS, each of which only has a tiny part to play. In fact, in the largest MS genetics study to date, involving more than 9,700 people with MS and 17,000 people without MS, researchers identified 57 genes linked to MS. Most of these genes influence specific cells in the immune system.

- **Vitamin D**
  Low levels of vitamin D might be an environmental factor that alters the way a particular gene works. This might increase the risk of developing MS.

  It's not yet clear exactly what the relationship is between levels of vitamin D, genes and MS. But we know that many factors are involved in someone developing the condition, and research continues.

- **Other autoimmune conditions**
  There is a remarkable overlap between the genes which influence the risk of developing MS and those that influence the risk of other autoimmune conditions (where the immune system mistakenly attacks the body instead of defending it from infection).
Can gene therapy help?

In some health conditions, only one faulty gene is responsible. In these conditions it might sometimes be possible to replace this faulty gene to help prevent or cure the condition. This type of treatment is called 'gene therapy'.

Because MS is so complex, with many genes and environmental factors contributing, gene therapy is not an option. But there are very good reasons to study the genes involved. The more researchers understand about what’s happening in the body, the more likely they are to focus on the right area and find an effective treatment.

Explaining genes and MS to children and teenagers

This is a complex topic, but one that's often of interest to children and young people in families with MS. The following websites might be helpful for explaining genes and MS to children or teenagers:

**KidsHealth**
An American website with information about genes, for children and teenagers.  
http://kidshealth.org (search for 'genes')

**YoungMS**
The MS Society website for children and teenagers.  
Includes clear information about MS for children and interactive message boards for teenagers.  
www.youngms.org.uk
References

A list of references is available on request, and all cited articles are available to borrow from the MS Society library (there may be a small charge). Contact the UK Information Team, or visit www.mssociety.org.uk/library

Further copies of this factsheet or other MS Society information

Find out more
For more about the latest research into genes and MS, see www.mssociety.org.uk/research

If you don't have access to a printer and would like a printed version of this factsheet, or any other MS Society information, call the Information Team on 020 8438 0799 (weekdays, 9am-4pm) or email infoteam@mssociety.org.uk

MS Helpline
The MS Helpline offers confidential emotional support and information to anyone affected by MS, including family, friends, carers, newly diagnosed or those who have lived with the condition for many years. Calls can be made in over 150 different languages, via an interpreter.

Call freephone 0808 800 8000 (weekdays 9am-9pm, except bank holidays) or email helpline@mssociety.org.uk

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