

## Genes and MS

### 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 information.

### 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'.

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 100 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?

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 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

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.

## 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 almost 30,000 people with MS and just over 50,000 people without MS, researchers identified a total of 110 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).

There is still a lot to discover. How do the different genes involved affect each other? How do they react to environmental factors? How can these findings be translated into treatments?

Research is already happening to try to find these answers. You can read more on our website:

[www.mssociety.org.uk/research](http://www.mssociety.org.uk/research)

## 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.

## About this resource

### Thanks

With thanks to Dr Alasdair Coles and all the people affected by MS who contributed to this resource.

Disclaimer: We have made every effort to ensure that the information in this publication is correct. We do not accept liability for any errors or omissions. The law and government regulations may change. Be sure to seek local advice from the sources listed.

### Let us know what you think

If you have any comments on this information or on the work of the MS Society, please send them to [resources@mssociety.org.uk](mailto:resources@mssociety.org.uk), or you can complete our short online survey at [www.surveymonkey.com/s/MSresources](http://www.surveymonkey.com/s/MSresources)

### 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 librarian on 020 8438 0900, or visit [www.mssociety.org.uk/library](http://www.mssociety.org.uk/library)

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## Further information from the MS Society

### Library

For more information, research articles and DVDs about MS, contact our librarian.

 020 8438 0900

 [librarian@mssociety.org.uk](mailto:librarian@mssociety.org.uk)

 [www.mssociety.org.uk/library](http://www.mssociety.org.uk/library)

### Resources

Our award winning information resources cover every aspect of living with MS.

 020 8438 0999

 [shop@mssociety.org.uk](mailto:shop@mssociety.org.uk)

 [www.mssociety.org.uk/publications](http://www.mssociety.org.uk/publications)

### Helpline

The Freephone MS Helpline offers confidential emotional support and information for anyone affected by MS, including family, friends and carers.

Information is available in over 150 languages through an interpreter service.

 0808 800 8000 (weekdays 9am–9pm)

 [helpline@mssociety.org.uk](mailto:helpline@mssociety.org.uk)

# The Multiple Sclerosis Society

More than 100,000 people live with multiple sclerosis in the UK. Every one of them shares the uncertainty of life with MS. We're funding research and fighting for better treatment and care to help people with MS take control of their lives.

With your support, we will beat MS.

## Contact us

### MS National Centre

 020 8438 0700

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### MS Helpline

 Freephone 0808 800 8000  
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### Online

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The MS Society provides this information free of charge but if you would like to help cover the cost, which will help towards our essential work, please call 0800 100 133 or visit the fundraising section of our website to make a donation. Anything you can give will be greatly appreciated.

#### Multiple Sclerosis Society

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