Genetics and Dementia

Dementia – is it inherited?

People living with dementia may be concerned that this condition has been inherited and that they could pass it on to their children. Family members of people living with dementia may be concerned that they will be more likely to develop dementia themselves.

Researchers around the world are working to find out more about genetics and dementia. Currently there is more that we don't understand than there is that we do understand. This sheet outlines what is known at present.

There are two ways that our genes can be involved in causing a dementia illness:

- Single gene abnormalities that are so powerful that anyone with that faulty gene has a very high risk of developing dementia. These conditions are rare but they often lead to strongly inherited patterns of dementia.

- Multiple different genes of small effect that combine with environmental factors to raise the risk of dementia. Most diseases that cause dementia fall into this category and they are more weakly inherited.

Therefore the vast majority of cases of dementia are not strongly inherited. Some rare causes of dementia are strongly inherited, for example dementia caused by Huntington's disease. This is an "autosomal dominant" disease, which means that every child of someone with the illness has a 50% chance of getting the faulty gene and will go on to get the disease if they live long enough. If you do not inherit the gene you cannot pass on this condition to your children and you will not get the disease.

Some other dementias have both inherited and non-inherited forms. Here are some examples.

Alzheimer's disease

Alzheimer's disease, the most common cause of dementia, is generally not strongly inherited. The most important risk factor for Alzheimer's disease is advancing age but there are also many other factors such as how active we have kept our brains, whether or not we have had a head injury, the state of the blood supply to our brain, whether we smoke and complex factors to do with cholesterol. Our genes contribute to some of these – for example, how our cholesterol is handled and how our blood supply changes as we get older. The overall genetic contribution to our risk of Alzheimer's disease is complicated, but it means that if a parent or sibling in our family has Alzheimer's disease, our own risk is increased compared to someone who does not have a "first degree relative" with Alzheimer's, assuming we live long enough to develop the disease in the first place. However, lifestyle factors are probably more important and mystery factors that we know nothing about yet are the most important of all.

In less than 1% of cases Alzheimer's disease is strongly inherited. The disease then develops at a much earlier age with individuals sometimes being affected as early on as their 40s. Genes that code for three important chemicals in the brain (called APP, PS1 and PS2) have been identified as causing this early-onset or familial form of Alzheimer's disease in an "autosomal dominant" way if they are faulty. People with Down Syndrome are also at much higher risk of Alzheimer's Disease but they do not inherit this from their parents.

Lewy Body dementia

Lewy Body dementia generally occurs in people with no known family history of this disease. It is likely that there are many genes that interact with each other to raise or lower our risk and it is not yet possible to make any good predictions about individuals. Rare, strongly inherited cases have occasionally been reported in some families internationally, generally occurring in relatively young adults.

Vascular dementias

There are several different diseases that cause dementia due to poor blood supply to the brain. Genes are definitely involved in this in the same way that strokes and heart attacks can sometimes run in the family, but lifestyle factors are also very important; whether or not we have a good diet, exercise, smoke or take medical treatments to lower these risks. Overall, these dementias are not strongly heritable. However, there are some very rare "autosomal dominant" conditions that can affect younger adults.

Frontotemporal dementias

Less than 10% of the people with dementia have a frontotemporal dementia. It is estimated that up to 50% of people diagnosed with a frontotemporal dementia have a family history of the disease. In approximately 10% of these cases (that is, 1% of all people with dementia) this is another "autosomal dominant" condition In up to 40% of other cases, family members are at moderately increased risk, probably due to unidentified susceptibility genes.

What should I do?

If dementia has occurred in several family members over two or more generations in your family and at least one of them has definitely occurred below the age of 60 (preferably 55) you can talk to your GP about considering a referral to a specialist to review the history. They may refer on to the Genetics Service at Christchurch Public Hospital. It is very seldom possible to find a single gene culprit and therefore impossible to tell unaffected family members what their risks are, but on very rare occasions specific problems might be found. Sometimes when a family history is very strong it may be possible to bank people's blood so that future genetic advances might enable better risk assessment.

Anyone who is concerned about their chances of developing dementia as they age should do what we all know is good for our brains: eat healthy, keep our weight and cholesterol low, keep our blood pressure under control, stop smoking, drink alcohol only in moderation, exercise regularly, keep socially active and keep your brain active by trying new things.

Acknowledgements

* *Living with dementia.* April 2009. Alzheimer's Society UK
* 'Lewy Body Dementia'. *Headlines,* National newsletter of Neurological Foundation of NZ. Autumn 2009
* 'The genetics of FTD: should you worry'. The Association for Frontotemporal Dementias www.ftd-picks.org

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