



What Causes Parkinson Disease?

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This question is really a combination of two questions which are connected but must be answered separately. First, what causes the symptoms of Parkinson disease? And second, what causes someone to develop Parkinson's?

To address the former question, we must look at what is happening in the brain of someone with Parkinson's.

The symptoms of Parkinson disease are primarily caused by a lack of dopamine in the brain. Dopamine is a neurotransmitter which allows the brain to send signals between itself and other parts of the body, via nerve cells. When there is a lack of dopamine in the brain these nerves fire abnormally, resulting in symptoms of Parkinson's.

Now, you may be asking yourself, "but why is there a lack of dopamine in the brain?" For that answer

we must look to the part of the brain responsible for dopamine production, the **substantia nigra**. Nerve cells within the substantia nigra are responsible for the production of dopamine and the relay of messages which plan and control the body's movements (everything from walking and speaking to your digestive system). By the time a person is diagnosed with Parkinson's they have lost between 60 - 80% of these dopamine producing nerve cells.¹ As the disease progresses these cells will continue to die.

Unfortunately, this is where things become a bit foggier. The cause of the cell death within the substantia nigra is currently unknown. The good news is that research is currently being done to answer this very question. Some researchers believe it may be related to the accumulation of a protein called Alpha-synuclein within the nerves of the substantia nigra. Others are exploring the possibility that it could be related to a dysfunction in the bodies mitochondrial (the mitochondria are the powerhouse of the cell) or waste removal systems.²



Now that we have explored what is happening in the brain of a person with Parkinson's to cause symptoms, we need to talk about the other half of the question "What causes someone to develop Parkinson disease in the first place?" The short answer is that the development of Parkinson's is caused by some combination of genetics and environment³, though this answer is somewhat unsatisfactory as most everything in life can fall into one of those two categories. So, what do researchers mean when they are talking about genetics and environment?

Researchers have identified many genes which may play a role in the development of the disease and attribute approximately 10% of Parkinson's cases to genetics. So, this means that most people with Parkinson's have no genetic link⁴. Also, just because you have a Parkinson's-related gene doesn't mean you are guaranteed to develop Parkinson's either, actually far from it, most people with a Parkinson-related gene **won't** develop Parkinson's. In a small number of cases Parkinson disease is considered inherited and can affect multiple family members, but even in those cases there is no guarantee that the children of someone with inherited Parkinson disease will develop Parkinson's (though they might be at an increased risk). That is why we must look to environmental factors as well.

References:

¹<https://www.ninds.nih.gov/health-information/patient-caregiver-education/hope-through-research/parkinsons-disease/parkinsons-disease-challenges-progress-and-promise#:~:text=By%20the%20time%20Parkinson's%20is,brain%20systems%20are%20also%20damaged.>

²<https://cureparkinsons.org.uk/what-is-parkinsons/the-science-behind-parkinsons/>

When discussing environmental factors, it is important to note that from a scientific perspective it is not only about where you live, the air you breathe, what you consume, your career, et cetera, it is everything that you do, have happen to you, and/or are exposed to throughout your life. Certain environmental factors have been linked to an increased likelihood of developing Parkinson's; these include (but are not limited to):

- » Head injuries and traumatic brain injuries.
- » Exposure to certain metals/heavy metals.
- » Geographical location. Some parts of the world have a much higher prevalence of PD than others. In the US for example, there are significantly more people with PD in the Midwest and Northeastern parts of the country⁵.
- » Exposure to pesticides and herbicides.
- » Exposure to solvents and Polychlorinated Biphenyls (PCBs). These are man-made chemicals which may be used in a variety of industries⁶.

The environmental factors listed above have been identified as risk factors which may increase a person's likelihood to develop Parkinson disease, though these risk factors alone do not cause Parkinson's. This is why researchers believe that some people may have a genetic make-up which makes them more susceptible to the effects of these environmental factors. It is likely this combination of genetic susceptibility and exposure to risk factors in the environment which causes an individual to develop Parkinson disease.

I hope this article has helped to explain the current understanding of Parkinson disease and what causes it. We don't have all the answers yet but, through research, we are ever approaching a better understanding of this disease and its causes.

³<https://www.parkinson.org/understanding-parkinsons/causes>

⁴<https://www.parkinson.org/understanding-parkinsons/causes/genetics>

⁵<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2865395/>

⁶<https://www.parkinson.org/understanding-parkinsons/causes/environmental-factors>