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# What are Parkinson's Disease Causes?

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**Review Article**

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## Abstract

Parkinson's disease (PD) is a progressive neurological disorder that results from the loss of dopamine-producing neurons in the brain. While the exact cause of PD is not fully understood, research suggests that a combination of genetic, environmental, and lifestyle factors may contribute to its development. Genetic mutations in certain genes, including Leucine-rich repeat kinase 2 (LRRK2), Alpha-synuclein (SNCA), and Parkin, have been linked to PD, although they account for only a small percentage of cases. Exposure to toxins such as pesticides and herbicides, head injuries, advancing age, male gender, diet, and a history of smoking have also been identified as potential risk factors for PD. Overall, it is likely that PD results from a complex interplay of factors that lead to the loss of dopamine-producing neurons in the brain, resulting in the characteristic symptoms of the disease.

**Keywords:** Parkinson's Disease; Genetics; Dopamine; Neurological Disorders

**Abbreviations:** PD: Parkinson's Disease; GBA: Glucocerebrosidase.

## Introduction

Parkinson's disease (PD) is a chronic and progressive neurological disorder that affects movement. It is caused by the degeneration of dopamine-producing neurons in the brain, which leads to a decrease in the levels of dopamine, a neurotransmitter that plays a crucial role in motor control. As a result, people with PD experience a range of motor symptoms, including tremors, rigidity, slowness of movement (bradykinesia), and postural instability [1]. PD can also cause non-motor symptoms, such as depression, anxiety, sleep disorders, and cognitive impairment. While there is currently no cure for PD, there are treatments that can help to manage symptoms and improve quality of life for people living with the disease [2].

The exact cause of PD is not fully understood, but it is believed to be a combination of genetic and environmental factors. Research has shown that certain genetic mutations can increase the risk of developing PD, but not everyone with these mutations will develop the condition [3]. Environmental factors, such as exposure to toxins, may also play a role in the development of PD [4]. While the exact reason for this loss of cells is not known, researchers believe it may be related to the accumulation of abnormal proteins in the brain, oxidative stress, or inflammation [5].

Overall, while there is still much to be learned about the exact causes of PD, ongoing research is helping to shed light on this complex and debilitating condition. This review places emphasis on the potential causes of PD, aiming to

provide a thorough examination of the various factors that could contribute to the development of the disease.

## Causes

The causes of PD disease are complex and multifactorial, and the exact underlying mechanisms are not fully understood. However, several factors have been identified that may contribute to the development of the condition. These include:

### Dopamine Level

Dopamine is a neurotransmitter that plays a critical role in movement and coordination, and its loss is a key factor in PD. In the brain, dopamine is produced by neurons in an area called the substantia nigra, which is in the midbrain. In PD, the degeneration of dopamine-producing neurons in the substantia nigra leads to a decrease in dopamine levels in the brain [6]. Dopamine is involved in the control of movement through a complex network of circuits in the brain. The loss of dopamine in PD disrupts these circuits, leading to the characteristic motor symptoms of the disease, such as tremors, rigidity, and slowness of movement (bradykinesia). The motor symptoms of PD can be improved by treatments that increase dopamine levels in the brain. One of the most effective treatments for PD is levodopa, which is a precursor to dopamine that can cross the blood-brain barrier and be converted to dopamine in the brain [6]. Other treatments for PD, such as dopamine agonists, also work by increasing dopamine levels in the brain. While dopamine plays a crucial role in the motor symptoms of PD, it is important to note that other neurotransmitters, such as acetylcholine and norepinephrine, are also involved in the disease [7]. Additionally, the non-motor symptoms of PD, such as depression, anxiety, and cognitive impairment, are likely to be caused by a combination of factors, including the loss of dopamine and other neurotransmitters, as well as changes in brain circuits and other neurochemicals [6].

### Genetics

There are several genetic causes of PD, although the majority cases of PD are not directly inherited. The genetic causes of PD are usually classified into two categories: rare monogenic forms and more common forms with complex inheritance.

**Rare Monogenic Forms:** These forms of PD are caused by mutations in a single gene and are relatively rare. The most well-known monogenic form of PD is caused by mutations in the Alpha-synuclein (SNCA) gene, which provides instructions for making alpha-synuclein protein. These mutations result in the accumulation of alpha-synuclein protein in the brain, which is a hallmark of PD. Other genes that have been associated with monogenic forms of PD include Leucine-rich repeat kinase 2 (LRRK2), PARK2, PTEN-induced kinase 1 (PINK1), and PARK7 [8].

**Complex Forms with Polygenic Inheritance:** Most cases of PD are believed to be caused by a combination of genetic and environmental factors. In these cases, multiple genes contribute to the risk of developing PD, but no single gene is responsible for the disease. Variants in several genes have been associated with an increased risk of PD, including SNCA, LRRK2, glucocerebrosidase (GBA), and microtubule-associated protein tau (MAPT). However, the risk associated with each of these genetic variants is relatively small, and the contribution of environmental factors is likely to be significant [4].

### Environmental Factors

There are several environmental factors that have been associated with an increased risk of developing the condition. Some of these factors include:

**Pesticides and Herbicides:** Exposure to pesticides and herbicides has been linked to an increased risk of PD. Several studies have found that farmers and agricultural workers who are exposed to these chemicals are more likely to develop the condition [9].

**Solvents and Chemicals:** Exposure to solvents and other chemicals, such as trichloroethylene and perchloroethylene, has also been linked to an increased risk of PD. These chemicals are often found in industrial settings, and workers who are exposed to them are at greater risk of developing the condition [10].

**Heavy Metals:** Exposure to heavy metals, such as lead and mercury, has been associated with an increased risk of PD. These metals can be found in soil, water, and air pollution, as well as in some occupational settings [11].

**Head Injuries:** There is evidence to suggest that head injuries may increase the risk of developing PD. This is particularly true for people who have experienced repeated head injuries, such as boxers or football players [12].

### Advancing Age

Advancing age is a significant risk factor for developing PD, but it is not the sole cause of the condition. While PD can occur at any age, it is most diagnosed in people over the age of 60 [13]. As we age, our cells and tissues undergo a process of natural wear and tear that can lead to the accumulation of damage and dysfunction in the brain. In PD, this damage affects a specific group of neurons in the brain that produce dopamine, a neurotransmitter that helps to regulate movement and other bodily functions. However, it is important to note that not everyone who ages develops PD, and not everyone with PD is elderly [11].

### Lifestyle

While there is no single lifestyle factor that can be definitively linked to PD, there are several lifestyle factors that may contribute to an increased risk of developing the condition. These include:

**Lack of exercise:** A sedentary lifestyle has been associated with an increased risk of PD. Regular exercise has been shown to be beneficial in reducing the risk of developing the condition [14].

**Unhealthy diet:** There is some evidence to suggest that a diet high in saturated fats, processed foods, and dairy products may increase the risk of developing PD. On the other hand, a diet rich in fruits, vegetables, whole grains, and lean proteins may help to lower the risk of the condition [15].

**Smoking:** Smoking has been shown to be associated with a decreased risk of developing PD. However, given the many health risks associated with smoking, it is not recommended as a strategy to reduce the risk of PD [16].

**Drinking coffee:** There is some evidence to suggest that drinking coffee may lower the risk of developing PD. However, more research is needed to fully understand the relationship between coffee consumption and PD [17]. It is important to note that lifestyle factors alone are unlikely to cause PD, but they may contribute to an increased risk in combination with other factors such as genetics and environmental exposures. While we cannot control all the factors that contribute to PD, leading a healthy lifestyle that includes regular exercise and a balanced diet may help to reduce the risk of developing the condition.

### Gender

Gender is not a direct cause of PD, but there are some differences in how the condition affects men and women. Research has shown that men are slightly more likely than women to develop PD. This gender difference may be related to hormonal differences between men and women, as well as differences in environmental exposures and other factors [2]. In addition to differences in the prevalence of the condition, there are also some differences in how PD affects men and women. For example, women with PD may experience more severe symptoms during certain phases of the menstrual cycle, and they may be more likely to experience depression and anxiety than men with the condition [18]. It is important to note, however, that PD can affect anyone regardless of gender, and that the symptoms and progression of the condition can vary widely between individuals. If you are concerned about your risk of developing PD or if you are experiencing symptoms of the condition, it is important to speak with your healthcare provider for an accurate diagnosis and appropriate treatment.

## Discussion

PD is a neurological disorder that affects movement and other bodily functions. The exact cause of PD is not fully understood, but it is believed to be caused by a combination of genetic and environmental factors. Genetic factors are thought to play a role in the development of PD. Some inherited genetic mutations have been linked to an increased risk of the condition, although these mutations are relatively rare and are thought to account for only a small percentage of cases [1]. It is important to note that having a genetic mutation associated with PD does not necessarily mean that a person will develop the disease. Genetic testing and counseling can help people to understand their risk of developing PD and make informed decisions about their health.

Environmental factors are also believed to contribute to the development of PD [4]. Exposure to certain environmental toxins, such as pesticides and herbicides, has been linked to an increased risk of the condition. Other environmental factors that have been associated with an increased risk of PD include head injuries, certain medications, and certain lifestyle factors such as lack of exercise and an unhealthy diet [12, 4]. In PD, a specific group of neurons in the brain that produce dopamine, a neurotransmitter that helps to regulate movement and other bodily functions, become damaged and dysfunctional. This damage leads to the characteristic symptoms of PD, including tremors, stiffness, and difficulty with movement and coordination [6].

Overall, the causes of PD are complex and multifactorial. More research is needed to fully understand the underlying mechanisms that lead to the development of the condition, and to develop more effective treatments and preventative measures. However, by identifying and managing risk factors such as exposure to environmental toxins and leading a healthy lifestyle, it may be possible to reduce the risk of developing PD.

## Conclusion

In conclusion, the exact causes of PD are not fully understood, but a combination of genetic and environmental factors is thought to contribute to the development of the condition. Some of the factors that have been associated with an increased risk of PD include exposure to pesticides and other environmental toxins, head injuries, advancing age, and certain lifestyle factors such as lack of exercise and an unhealthy diet. While we cannot control all the factors that contribute to PD, leading a healthy lifestyle that includes regular exercise, a balanced diet, and avoidance of environmental toxins may help to reduce the risk of developing the condition. If you are concerned about your

risk of developing PD or if you are experiencing symptoms of the condition, it is important to speak with your healthcare provider for an accurate diagnosis and appropriate treatment.

## References

1. Uwishema O, Onyeaka H, Badri R, Yücel AN, Korkusuz AK, et al. (2022) The understanding of Parkinson's disease through genetics and new therapies. Brain and behavior 12(5): 2577.

2. Abraham A, Bay AA, Ni L, Schindler N, Singh E, et al. (2023) Gender differences in motor and non-motor symptoms in individuals with mild-moderate Parkinson's disease. Plos one 18(1): e0272952.

3. Murakami H, Shiraishi T, Umehara T, Omoto S, Iguchi Y (2023) Recent advances in drug therapy for parkinson's disease. Intern Med 62(1): 33-42.

4. Madhaw G, Kumar N (2023) Dietary and Environmental Risk Factors in Parkinson's Disease and Alzheimer's Disease: Beware of Your Food Plate and Your Surroundings!. Annals of Indian Academy of Neurology 26(2): 101-103.

5. Sheikhpour E, Mard SA, Farbood Y, Bavarsad, K, Sarkaki A (2023) The effects of gallic acid and vagotomy on motor function, intestinal transit, brain electrophysiology and oxidative stress alterations in a rat model of Parkinson's disease induced by rotenone. Life Sci 15: 121356.

6. Rodríguez Pallares J, García Garrote M, Parga JA, Labandeira García JL (2023) Combined cell-based therapy strategies for the treatment of Parkinson's disease: focus on mesenchymal stromal cells. Neural Regen Res 18(3): 478-484.

7. Wang S, Wu T, Cai Y, Yu Y, Chen X, et al. (2023) Neuromelanin magnetic resonance imaging of substantia nigra and locus coeruleus in Parkinson's disease with freezing of gait. Front Aging Neurosci 15: 1060935.

8. Billingsley KJ (2019) Structural variation in Parkinson's disease: focusing on the role of Transposable elements in disease predisposition and pathogenesis. The University of Liverpool (United Kingdom).

9. Caioni G, Cimini A, Benedetti E (2022) Food Contamination: An Unexplored Possible Link between Dietary Habits and Parkinson's Disease. Nutrients 14(7): 1467.

10. Aamodt WW, Willis AW, Dahodwala N (2023) Racial and Ethnic Disparities in Parkinson Disease: A Call to Action. Neurol Clin Pract 13(2): e200138.

11. Zhao Y, Ray A, Portengen L, Vermeulen R, Peters S (2023) Metal exposure and risk of Parkinson's disease: a systematic review and meta-analysis. Am J Epidemiol.

12. Ilmaniemi S, Tolppanen AM, Herukka SK, Hartikainen P, Hartikainen S (2023) The incidence and outcomes of head injuries in people with and without Parkinson's disease. European Journal of Neurology.

13. Safiri S, Noori M, Nejadghaderi SA, Mousavi SE, Sullman MJ, et al. (2023) The burden of Parkinson's disease in the Middle East and North Africa region, 1990–2019: results from the global burden of disease study 2019. BMC Public Health 23(1): 107.

14. Martín Núñez J, Calvache Mateo A, López López L, Heredia Ciuró A, Cabrera Martos I, et al. (2023) Effects of Exercise-Based Interventions on Physical Activity Levels in Persons With Parkinson's Disease: A Systematic Review With Meta-analysis. J Geriatr Phys Ther.

15. Xu S, Li W, Di Q (2023) Association of Dietary Patterns with Parkinson's Disease: A Cross-Sectional Study Based on the United States National Health and Nutritional Examination Survey Database. European Neurology 86(1): 63-72.

16. Sugier PE, Lucotte EA, Domenighetti C, Law MH, Iles MM, et al. (2023) Investigation of shared genetic risk factors between Parkinson's disease and cancers. Mov Disord 38(4): 604-615.

17. Ko TK (2023) Does Drinking Coffee Reduce the Incidence of Parkinson's Disease?. Cureus 15(1): e34296.