Australian Brain Alliance

CRACK THE BRAIN'S CODE

PARKINSON'S DISEASE

What is Parkinson's disease?

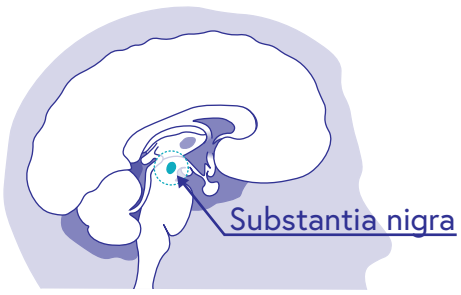
Parkinson's disease is a brain condition that affects motor skills and the ability to control movements. People with Parkinson's may also suffer from cognitive impairment, anxiety, depression, constipation, difficulties with sleep, smell, swallowing, speech, writing and vision.

More than 70 000 Australians are currently living with Parkinson's. Diagnoses are on the rise, with more than 32 new diagnoses every day. Although those with Parkinson's disease are mainly the elderly, 20% of those with the disease are under 50 years and 10% are diagnosed before 40.

It is the second most common neurological condition in Australia, but one of the least well understood. There is no definitive test, and no cure, for Parkinson's.

Although Parkinson's disease is a manageable condition, it is progressive, and degenerative—it simply gets worse over time.

Parkinson's disease results from reduced dopamine production in the substantia nigra regions of the brain.



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Parkinson's disease occurs when brain cells that produce the neurotransmitter dopamine are lost, resulting in reduced dopamine production. This is accompanied by the formation of progressive widespread abnormal aggregates of the synaptic protein alpha-synuclein, forming what are known as Lewy bodies.

Dopamine is responsible for smooth, coordinated muscle movements and our drive or desire to get things done. Prolonged reduction in dopamine eventually causes the symptoms of tremor (shakiness), rigidity, slowness and loss of motor control. Often these symptoms are preceded by the loss of the sense of smell.

While deterioration of the dopamine system and its effects on movement are the best known features of the disease, other brain areas and the gut are also affected. The degeneration that occurs in these other brain regions later in the disease is responsible for cognitive impairment and serious disability that often leads to loss of independence.

There is no definitive test or biomarkers for early diagnosis of Parkinson's disease. By the time Parkinson's disease has been diagnosed, usually following the appearance of conclusive symptoms, around 70% of the dopamine-producing cells have already been lost.

Scientists are unsure what causes the initial loss of the dopamine-producing cells. Current thinking is that Parkinson's could be the result of environmental toxins, such as pesticides; oxidative damage caused by free radicals—unstable molecules—within brain cells/the body; infections; genetic predisposition, or a combination of all or any of these.

Treatment of the symptoms of Parkinson's disease usually takes the form of complex combinations of drugs that attempt to mimic the role of dopamine in the brain.

Experimental neurotechnology treatments include brain stimulation therapies/techniques such as deep brain stimulation (DBS) and transcranial direct current stimulation (tDCS) that target and stimulate regions of the brain responsible for movement. They attempt to block the abnormal signals that result in tremor and other symptoms. These treatments aim to ameliorate symptoms, but cannot at this stage address the underlying problem of reduced dopamine production.

The Australian Brain Initiative will nurture the basic brain research required to develop a more comprehensive understanding of brain function, the role of the substantia nigra and how deterioration in dopamine production in the nigro-striatal pathways can occur, as well as how progressive aggregation of the synaptic protein alpha-synuclein occurs in the brain.

The Initiative will also progress collaboration between research and industry to advance improved pharmaceutical treatments for Parkinson's disease. This will include development of new biological assays for diagnosing the disease, predicting its progression, and identifying appropriate drug targets and dosage.

Objective measurement of the symptoms of Parkinson's disease, through biomarkers and by wearable technologies may lead to early detection, improved therapies, better understanding of disease mechanisms and improved clinical care.

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