

**2021 PSBR High School Essay Contest**  
***Grand Essayist***

**Tino K.**

Julia Reynolds Masterman Laboratory and Demonstration School  
Philadelphia, PA

December of 2019 was the last time I saw my grandfather. I remember swimming in the community pool with my sister, my grandfather watching us from his wheelchair nearby. His Parkinson's disease had progressively debilitated him during the last two decades of his life, rendering him from a dedicated physician to being unable to walk and needing assistance with even the most basic activities.

Parkinson's disease, currently afflicting approximately 10 million people worldwide, is an incurable neurodegenerative disorder caused by the death of brain cells that produce a type of neurotransmitter called dopamine. While many associate the word dopamine with feelings of motivation and pleasure, dopamine is also crucial to cognitive function, attention span, and movement in the human body. The symptoms of Parkinson's can generally become apparent after approximately 70% of the brain cells in charge of making dopamine have died.

The majority of the fatal dangers of having Parkinson's disease exist not in the disease's symptoms but in the complications that can result from them. Reduced movement can cause blood clots in the legs, falls and head trauma can occur when a person can no longer hold themselves steady, and the inability to swallow properly that is sometimes a symptom of Parkinson's can lead to aspiration introducing a risk of deadly pneumonia. Additionally, patients with more severe Parkinson's who undergo surgical procedures necessary for treating complications can die from anesthesia and intubation which is what my grandfather succumbed to in March 2020 at the age of 81.

Even so, thanks to scientific advancements using animal research, people with Parkinson's can generally expect to live almost as long as people without affliction. Ever since Dr. Arvid Carlsson made the connection in 1957 between reduced levels of dopamine and Parkinson's symptoms using rabbit preclinical models, drug discovery in Parkinson's has largely focused on increasing and sustaining dopamine levels in the brain. A commonly used drug whose effectiveness to treat Parkinson's symptoms was also discovered by Dr. Carlsson is levodopa, a medicine that my grandfather took to alleviate his symptoms. Levodopa works by being converted into dopamine in the brain and is usually taken with a drug called carbidopa which helps prevent levodopa from being broken down before it reaches the brain. Medications like levodopa discovered and developed through animal research are one of the main reasons why individuals with Parkinson's can still have long lives. Unfortunately, their positive effects wear off over time as connections in the brain are dampened under continuous drug exposure. While there are other drugs used to treat Parkinson's symptoms, none of them are curative, which is why the best strategy for fighting Parkinson's disease and other neurotransmitter diseases remains prevention.

Some cases of Parkinson's are caused by inherited genetic mutations; however, the vast majorities are a result of substances prevalent in a person's diet or environment. Just as animal research helped advance therapies for treating Parkinson's, animal research has also contributed to better our understanding of the causes of the disease. Studies using rodents helped identify the causative role the potent pesticide Rotenone and other pesticide chemicals have in Parkinson's and resulted in the recommendation to thoroughly wash vegetables and grains before consumption to remove toxins and the phasing out of several pesticides.

While a cure for Parkinson's is not a reality today, animal research is helping to move humanity into a world where Parkinson's and other neurodegenerative diseases no longer mean years of suffering. Using model organisms such as primates and rodents, new therapies for neurodegenerative diseases are being developed, including altering the genes of the dopamine-producing cells in people with Parkinson's, introducing stem cells into the area of cell loss, and subduing other parts of the brain which recent studies have shown may also contribute to Parkinson's symptoms through hyperactivity (known as deep brain stimulation).

My grandfather was able to live past eighty with Parkinson's disease because of the medications that were developed through animal research, but his disease eventually led to significant suffering and ultimately his death. Ongoing crucial animal research worldwide that has led to so many medical advancements for innumerable diseases will most likely one day ensure that diseases like Parkinson's no longer dominate a person's life. I am incredibly grateful for the time I had with my grandfather thanks in large part to responsible animal research, and I remain hopeful that this research will help one day allow people of all ages to live full healthy lives being able to enjoy with others anything they dream of doing.

#### Works Cited

Bhandari, Smitha. "Dopamine: What It Is & What It Does." *WebMD*, WebMD, June 2019, [www.webmd.com/mental-health/what-is-dopamine](http://www.webmd.com/mental-health/what-is-dopamine).

"Can Environmental Toxins Cause Parkinson's Disease?" *Johns Hopkins Medicine*, [www.hopkinsmedicine.org/health/conditions-and-diseases/parkinsons-disease/can-environmental-toxins-cause-parkinson-disease#:~:text=Environmental%20Factors%20in%20Parkinson's%20Disease,the%20incidence%20of%20Parkinson's%20disease](http://www.hopkinsmedicine.org/health/conditions-and-diseases/parkinsons-disease/can-environmental-toxins-cause-parkinson-disease#:~:text=Environmental%20Factors%20in%20Parkinson's%20Disease,the%20incidence%20of%20Parkinson's%20disease).

Goetz, Christopher G. "The history of Parkinson's disease: early clinical descriptions and neurological therapies." *Cold Spring Harbor perspectives in medicine* vol. 1,1 (2011): a008862. doi:10.1101/cshperspect.a008862

"Levodopa and Carbidopa." *MedlinePlus*, U.S. National Library of Medicine, June 2018, [medlineplus.gov/druginfo/meds/a601068.html](http://medlineplus.gov/druginfo/meds/a601068.html).

Mayo Clinic Staff. "Parkinson's Disease." *Mayo Clinic*, Mayo Foundation for Medical Education and Research, 8 Dec. 2020, [www.mayoclinic.org/diseases-conditions/parkinsons-disease/diagnosis-treatment/drc-20376062](http://www.mayoclinic.org/diseases-conditions/parkinsons-disease/diagnosis-treatment/drc-20376062).

Melinosky, Christopher. "Parkinson's Disease Research & New Treatments." *WebMD*, WebMD, 2020, [www.webmd.com/parkinsons-disease/guide/parkinsons-research-treatments](http://www.webmd.com/parkinsons-disease/guide/parkinsons-research-treatments).  
"Parkinson's Disease." *Animalresearch.info*, 2014, [www.animalresearch.info/en/medical-advances/diseases-research/parkinsons-disease/](http://www.animalresearch.info/en/medical-advances/diseases-research/parkinsons-disease/).  
"Reregistration Eligibility Decision for Rotenone ." United States Environmental Protection Agency, 2007.

Shaikh, Safiya I, and Himanshu Verma. "Parkinson's disease and anaesthesia." *Indian journal of anaesthesia* vol. 55,3 (2011): 228-34. doi:10.4103/0019-5049.82658  
Yeragani, Vikram K et al. "Arvid Carlsson, and the story of dopamine." *Indian journal of psychiatry* vol. 52,1 (2010): 87-8. doi:10.4103/0019-5545.58907

"Statistics." *Parkinson's Foundation*, [www.parkinson.org/Understanding-Parkinsons/Statistics#:~:text=Who%20Has%20Parkinson's%3F&text=Approximately%2060%2C000%20Americans%20are%20diagnosed,worldwide%20are%20living%20with%20PD](http://www.parkinson.org/Understanding-Parkinsons/Statistics#:~:text=Who%20Has%20Parkinson's%3F&text=Approximately%2060%2C000%20Americans%20are%20diagnosed,worldwide%20are%20living%20with%20PD).