



The Effects of Polyphenols on the Improvement of Movement in Parkinson's Modeled *C. elegans*

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Introduction and Background

The neurodegenerative disorder, Parkinson's disease (PD), is a debilitating disease that affects millions worldwide. Due to the complexity of the disorder, the etiology is still unknown. It is understood that PD degenerates dopamine neurons in the substantia nigra, effectively impairing motor movement. *Caenorhabditis elegans* is a free-living nematode that is a model organism due to its simplicity and shared molecular pathways and genomes with humans. Because of its simplicity, mutant forms can be used to study neurological diseases and pathological conditions, including PD. A variety of internal and external factors are speculated to be involved in the rate of degeneration of said dopaminergic neurons in the substantia nigra concurrently with PD. Nutrition intake is one of the external factors said to play a role in neuroprotection in neurological disorders such as PD. Polyphenols, of the phenol group of naturally occurring organic chemical compounds, are found in many superfoods and are presumed to have a positive impact on neurodegenerative disease.



An abstract graphic on the left side of the slide. It features several organic, rounded shapes in various colors: a large black shape with a white outline containing a solid orange circle; a teal shape with a white outline containing a solid orange circle; a white shape with a green outline containing a solid blue circle; and a smaller teal shape with a white outline containing a solid orange circle. There are also several small, solid circles in green, orange, and teal scattered around the larger shapes. The background is a light, pale blue.

Rationale

Dietary Intake contributes to not only neuroprotection in neurological disorders, but also promotes adult neurogenesis. By disregarding this sector of health, the potential regeneration of neurons in those with PD is lost and the effects of the disorder will only be exacerbated.



Hypothesis



Adding polyphenols to the growth medium of movement-impaired *C. elegans* will improve their movement.



Methods

01

NGM PLATING

02

CHUNKING

03

CHEMOTAXIS ASSAY¹

04

CHEMOTAXIS INDEX SCORING

05

RESULT ANALYSIS



1. Some strains were provided by the CGC, which is funded by NIH Office of Research Infrastructure Programs (P40 OD010440).

Results - Chemotaxis Index

	Wild Type <i>C. elegans</i>	WLZ1 <i>C. elegans</i>
Without Polyphenols	0.456	0.363
With Polyphenols	0.338	0.255

Results - Chi Square Goodness-of-Fit Analysis

	Expected	Observed	Chi Square	Total:
Without Polyphenols	68.238	64	0.264	0.534
With Polyphenols	81.699	77	0.270	

Chi Square: 0.534 (0.5 Probably of a larger value than X^2)

Analysis

Upon observation, the behavior of the polyphenol-affected *C. elegans* in both strains was subjectively more vigorous than the behavior of the non polyphenol-affected *C. elegans*.

Furthermore, the chemotaxis indices of the polyphenol affected *C. elegans* strains (wild type and WLZ1) were more positive than those of the non polyphenol affected *C. elegans* in each strain.

Results

Compatible with the hypothesis, polyphenols **do appear** to have a positive impact on the improvement of motor impairment in *C. elegans* with a weak statistical significance.

Extensions

Potential extensions to this study could include:

- Effect of varying quality of nutrition on the movement of Parkinson's-modeled *C. elegans*
- Using CRISPR-based techniques for genome engineering of Parkinson's modeled *C. elegans*

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References

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