Characterization of Chemosensation Defects *C. elegans* Parkinson's Disease Models

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Background

- Parkinson's disease is a progressive disorder that affects the nervous system
- Some symptoms are loss of facial expressions, slurring of speech, stiffness in movement, and loss of smell
- *C. elegans* are a roundworm used as a model organism to study human diseases
- *C. elegans* use chemosensation to detect compounds in their environment
- Parkinson's Disease can be modeled in *C. elegans* by manipulating specific genes

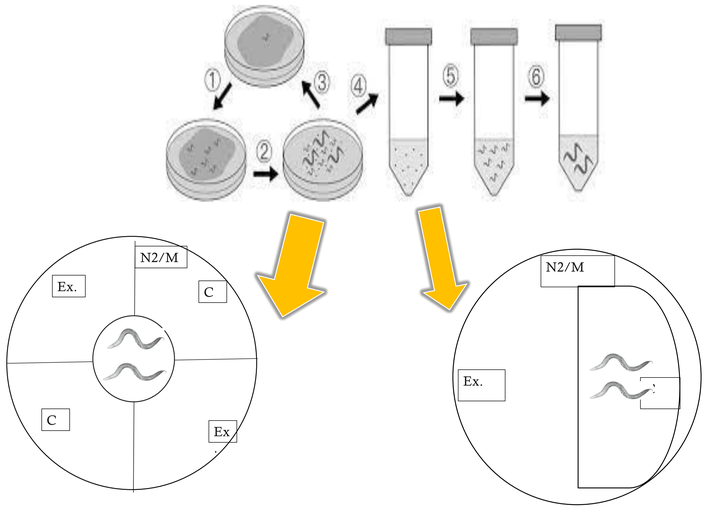
Objective and Hypothesis

- Our objective is to use *C. elegans* to study loss of ability to smell in Parkinson's Disease
- We hypothesized that the Parkinson's Disease worms will be less sensitive to a variety of odorants compared to the normal (healthy) worm

Methods

Chemotaxis Assay: Testing the worm's ability to detect chemicals in its environment

- **Wash worms using M9 buffer and chemotaxis assay buffer**
- **Parkinson's genes used: catp-6, PINK1, PARKIN1**



- **Experimental Odorants: Diacetyl, Benzaldehyde, and Octanol**
- **Control: Ethanol**
- **Experimental Tastant: Fructose**
- **Control: Water**

Results

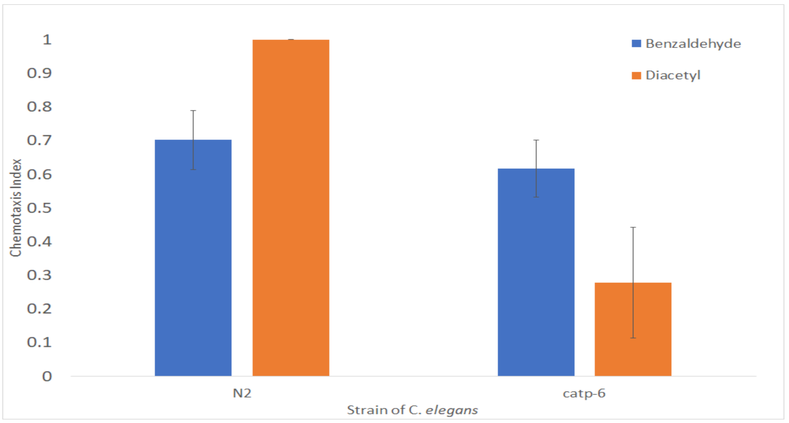


Figure 1. *C. elegans*' receptivity to Diacetyl and Benzaldehyde. No significant difference was found between N2 and catp-6 mutants in response to the Benzaldehyde (n = 3, t-test, P-value = 0.52). N2 worms were found to be significantly more attracted to Diacetyl as compared to catp-6 mutants (n = 3, t-test, P-value = 0.01). Error bars signify standard error.

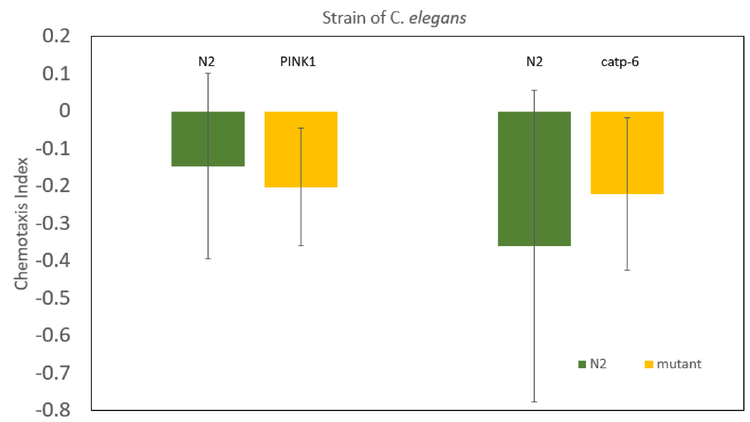


Figure 2. *C. elegans*' receptivity to Octanol with mutants, catp-6 and PINK1. No significant difference was found between N2 and catp-6 in response to the Octanol (n = 3, t-test, P-value = 0.61). No significant difference was found between N2 and PINK1 in response to the Octanol (n = 3, t-test, P-value = 0.96). Error bars signify standard error.

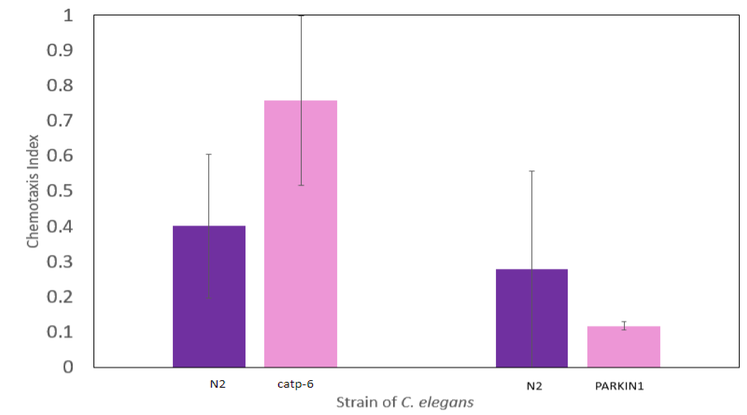


Figure 3. *C. elegans*' receptivity to Fructose with mutants, catp-6 and PARKIN1. No significant difference was found between N2 and catp-6 in response to the Fructose (n = 3, t-test, P-value = 0.32). No significant difference was found between N2 and PARKIN1 in response to the Fructose (n = 3, t-test, P-value = 0.67). Error bars signify standard error.

Conclusions

- Diacetyl attracted N2 worms significantly more so than catp-6 worms, but there was no difference with benzaldehyde
- Octanol and Fructose receptivity was not impacted in both Parkinson's worms
- Our hypothesis was partially supported by our data
- These results suggests that chemosensation defects in these worms are gene and chemical dependent
- These studies can provide a better understanding on Parkinson's Disease symptoms

Future Studies

- In the future we could test other Parkinson's worms or chemicals
- We could use *C. elegans* to test other Parkinson's Disease symptoms

References

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- Corsi, Ann K.; Wightman, Bruce; Chalfie, Martin. (2015) "A Transparent window into biology: A primer on Caenorhabditis elegans." *Worm Book*. pages 2–10.
- Yan, M; Huo, Yazhen; Yin, Shutao; Hu, Hongbu. (2018) "Review of Parkinson's Disease Etiology" Journal of Biochemistry. Vol. 17 pages 274-283.
- Photo credit: researchgate.net

Acknowledgements

We would like to thank Kathy Mainz for ordering supplies, Matthew Simonson for being our student mentor, and Janet Ugolino for guiding and leading us through our research.