## Section IV: Discussion

The first experiment in the present study examines the effects of 6-OHDA on the NL5901 C. elegans strain. There was significant decrease of locomotion of the 6-OHDA-induced worms ($p<0.05$) compared to the NL5901 strain and the N2 Wild Type. The significant decrease suggests that 6-OHDA impacts C. elegans movement, and nervous system. Since dopaminergic neurons primarily control movement in the nervous system, the decrease in locomotion would imply that there was a decrease in dopamine levels. 6-OHDA-induced NL9501 strain is the positive control of the experiment as it is the ideal Parkinson's model with induced oxidative stress, decreased dopamine levels and increased a-synuclein levels.

A limitation of this study would include the variability in 6-OHDA uptake among individual C. elegans, leading to inconsistent effects on locomotion. Another confounding variable is the age of the worms, as it is known that locomotion usually decreases with age. To account for this, worms were synchronized before all treatment and then chunked onto respective treatment plates. Additionally, environmental factors such as temperature and humidity can impact worm behavior. Thus, experiments were conducted under the fume hood, and plates were stored under controlled temperature and humidity to minimize these unintentional effects.

To determine the significance of the locomotion differences between groups, ANOVA testing was conducted, followed by post-hoc Student's t-tests for pairing comparisons. ANOVA was chosen because it allows us to compare differences among groups and identifies if there is an overall significant difference somewhere among the groups. Post-hoc t-tests further pinpoint where the differences lie exactly and among which pairwise groups. All results were statistically significant at $p<0.05$.

**Future Research**

Future research will focus on evaluating the toxicity of gold nanoparticles in nanomedicine by testing various concentrations and determining if toxicity varies. Since nanoparticle size can also influence toxicity levels, it is important to examine how different sizes of AuNPs impact a-synuclein levels and locomotion our Parkinson's model of C. elegans. Additionally, it would be beneficial to test whether different natural compounds yield similar results as curcumin or if they are more effective in the treatment of Parkinson's. Overall, further studies will include analyzing the molecular pathways by looking at dopamine levels, oxidative stress and mitochondrial dysfunction. Finally, extending this research and treatment to other neurodegenerative models and model organisms will help determine if the findings indicate a neuroprotective effect for Parkinson's disease.

## Section V: Conclusion

The current study investigates the neuroprotective effects of curcumin-coated gold nanoparticles on the 6-OHDA-induced NL5901 strain of C. elegans. A secondary objective is to determine the toxicity of the 20nm gold nanoparticles. After inducing the PD worms with 6-OHDA, the overall locomotion of the worms decreased, along with the a-synuclein levels – making it an ideal model for PD. Next, through the locomotion, a-synuclein, and survival assay, it was determined that worms exposed to CurAuNPs showed the most improvement regarding the difference between the controls and the groups. Thus, by combining natural compounds with aspects of nanomedicine, this study explores a novel, biocompatible strategy to address neurodegenerative diseases such as Parkinson's.