The findings of this project improve understanding of ginger-derived nanovesicles (GDNVs) in mitigating tauopathy and AD by targeting tau protein aggregates. The successful isolation and characterization of GDNVs suggest their viability as a natural, biocompatible therapeutic option. The results align with previous research indicating that plant-derived exosomes can cross biological barriers and deliver bioactive molecules effectively. However, our study extends this knowledge by demonstrating the specific ability of GDNVs to interact with tau proteins, potentially reducing their aggregation.

One of the findings was the efficiency with which GDNVs were able to interact with tau proteins. The data suggest that bioactive compounds in GDNVs, such as gingerols and shogaols, may play a role in modulating tau aggregation.

The use of *C. elegans* as a model organism provided an accurate model for assessing the impact of GDNVs on tau tangles. The observed reduction in tau aggregates in treated worms suggest potential for GDNVs. However, it is important to acknowledge the limitations of this model. While *C. elegans* provides a cost-effective system for screening, its complexity and protein expression patterns differ from those of humans. Future studies should include mammalian models to further validate these findings and determine whether similar effects are observed in more complex biological systems.

Another aspect is the delivery and stability of GDNVs in different conditions. While the study successfully demonstrated their impact on tau aggregation in a controlled environment, in vivo applications require a thorough understanding of their bioavailability, degradation, and biodistribution. Optimizing the formulation of GDNVs to enhance their stability and targeting efficiency could significantly improve their therapeutic efficacy.

In conclusion, this study highlights the potential of GDNVs in addressing tau-related neurodegenerative disorders. The ability of GDNVs to reduce tau aggregates presents an exciting avenue for further research in the field of neurodegeneration. While challenges remain, the natural origin, biocompatibility, and therapeutic potential of GDNVs position them as a compelling candidate for future drug development. Moving forward, integrating multidisciplinary approaches, including bioengineering, pharmacology, and clinical research, will be crucial in harnessing the full potential of GDNVs for neurodegenerative disease treatment.

Future Research

Future steps for this project include testing whether different concentrations of GDNVs will have an effect on the *C. elegans* responses. Long term effects of the treatment should also be studied. Lifespan assays could also be conducted.