The Effect of Potential Anti-Inflammatory Sex Hormones to Model the Gender and Age Discrepancy in Alzheimer’s Disease Using C. elegans as a Model Organism for a Preventative Mechanism

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The purpose of this study was to evaluate the gender discrepancy in Alzheimer's disease (AD), in which females are two-thirds more likely to be diagnosed with the disease than men. This was tested using estrogen and pregnenolone hormonal therapy, as hormones in females decrease rapidly following menopause, while male testosterone stays consistent. Pregnenolone is an anti-inflammatory hormone that hasn't been tested in AD gender experiments before. The hypothesis was that following estrogen therapy, the wild type and AD mutant C. elegans will increase due to increasing memory formation, decrease in toxic alpha-macroglobulin2 protein levels, a potential biomarker discovered, and that there will be positive behavioral effects and increases in lifespan. Two of the three hypotheses were supported as there was an increase in short and long term memory by 9-25% for varying groups compared to control. All worms decreased in memory less compared to the negative control by about 15%, especially in short-term, where some pregnenolone and estrogen groups increased dramatically. Three ELISAs were run to quantify the hormonal content in each worm group, and the last ELISA was an A2M ELISA as a toxic version of the protein has been found in females brains who had Alzheimer's and is a potential biomarker that could be treated. The treatment did help decrease A2M and overall, the experiment was a success and a preventative mechanism for AD. Mutant worms seemed to intake more estrogen, showing their lack of hormonal regulation. Some limitations were mechanical errors. Future research could be finding more biomarkers for the gender discrepancy. Overall, 3 of 4 hypotheses were supported, and the biomarker can be used to diagnose AD earlier, as well as use my treatment to help prevent it.

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