

Assessing the Effectiveness of the *Hericium erinaceus* Extract as Acetylcholinesterase Inhibitors

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Alzheimer's Disease (AD), a type of dementia, is attributed to the overproduction of the amyloid-beta ($A\beta$) protein caused by the cleavage of the amyloid precursor protein. This project focuses on deriving therapeutics to control the $A\beta$ protein by finding an effective acetylcholinesterase (AChE) inhibitor (AChE-I). Research indicates that low levels of acetylcholine (ACh) are correlated with high levels of the $A\beta$ protein, thus, an AChE-I will hypothetically decrease the level of the $A\beta$ protein and then treat Alzheimer's. The most effective known AChE-I is galantamine, an alkaloid isolated from *Lycoris radiata*. This particular project will focus on assessing the ability of the extract isolated from *Herichium erinaceus* as an AChE-I. The first paralysis assay with model organism *Drosophila melanogaster* demonstrated that high concentrations of the *H. erinaceus* isopropyl extract significantly increased paralysis in comparison with isopropyl alcohol. This suggests that the extracts are toxic, a characteristic of AChE-Is. An Ellman's Assay concluded that all the galantamine concentrations and the 0.05g/mL concentration of the extract significantly decreased the AChE concentration ($p < 0.01$). The second experiment of wildtype *D. melanogaster* and lower concentrations demonstrated no significance with the two lowest concentrations of galantamine and extracts compared to alcohol, which suggests the concentrations are safe and can be a new therapy. The implication of this research is that the low concentrations of the *H. erinaceus* extract could be a potential AChE-I and novel therapeutic for AD. Additionally, this research demonstrates the promise of utilizing fungal extracts to treat neurodegenerative diseases.