Investigating Differences in DRD4 Expression in a Comparison Analysis Between Young, Old, and Alzheimer's Frontal Cortex Brain Tissues

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Aging is associated with metabolic changes in the body as well as adaptations to age-related changes in order to maintain functional mechanisms in the body. An example of a potential compensatory mechanism can be seen in the dopamine D4 receptor (DRD4), a G-protein coupled receptor associated with attention and memory. The DRD4 receptor is activated through the binding of dopamine and involves sequential events stemming from a methionine on the receptor that ultimately promotes gamma oscillations, which are the fastest brain waves and are associated with attention and memory. DRD4 activation is dependent on methionine synthase, an enzyme responsible for maintaining the methionine in DRD4's signal transduction pathway. Previous research found that methionine synthase's activity dramatically decreases with age. In this work, it was hypothesized that there would be greater DRD4 gene expression in elderly to compensate for methionine synthase's decrease with age. DRD4's relation to attention also makes it of interest in Alzheimer's; due to epigenetic modifications of the DRD4 gene in Alzheimer's that favor decreased DRD4 expression, it was hypothesized that this age-related compensation expected in elderly would be dysfunctional in Alzheimer's. TaqMan RT-qPCR was performed to investigate DRD4 expression in post-mortem human frontal cortex brain tissue samples. Preliminary results depicted an age-related upregulation in DRD4 expression in elderly samples and a dysfunctional compensation in Alzheimer's samples. In the future, methylation levels of the DRD4 gene will be investigated in each of these samples to analyze epigenetics' potential role in affecting DRD4 gene expression.