

Actin Polymerization and its relation to the expression of Friedreich's Ataxia

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Introduction:

Friedreich's ataxia (FA) is a rare, inherited neurodegenerative disorder that primarily affects the nervous system, leading to progressive damage in the spinal cord, peripheral nerves, and brain. The condition disrupts motor and sensory functions, causing difficulty with movement, coordination, and balance. FA particularly affects the cerebellum, a part of the brain responsible for controlling movement and maintaining balance. This disease primarily damages the peripheral nerves, which transmit sensory and motor information between the brain and the rest of the body. This further explains the motor weakness, sensory loss, and unsteady movements (ataxia) commonly seen in individuals with FA. The condition typically manifests between the ages of 5 and 15, although it can develop later, even after age 25.

Methods:

My primary GEO dataset was GSE143574. This dataset consisted of patient-derived cells and *SETX* knockouts (human and mouse), analyzed using integrated genomic and transcriptomic approaches. I first used GEO2R to analyze the first 24 samples of the healthy and affected groups as my control and experimental groups respectively. I then put the top 250 differentially expressed genes through STRING to analyze any KEGG pathways that were displayed.

Results:

Actin Polymerization is a key component in this study as it indicates that the dysfunction in the formation of actin filaments, crucial for cell structure, movement, and division, can be the driving force behind Friedreich's ataxia. Of the 11 KEGG Pathways that were displayed in the STRING map, this study analyzed the bacterial invasion of epithelial cells. One of the significant genes involved in this pathway was GAB 1, with a negative log FC value, according to the GEO2R analysis. This symbolizes a slight downregulation of the bacterial invasion of epithelial cells pathway correlates to the degradation of actin polymerization, leading to loss in internalization and vacuole formation .

Discussion: Overall, this analysis showcases that there is a relationship between changes in the bacterial invasion of epithelial cells pathway and the increased expression of Friedreich's Ataxia. Though further research is necessary, I believe this provides a basis for the development of processes to reduce the expression of Friedreich's Ataxia in future cases.

Keywords: Ataxia, Genomic and Transcriptomic Analysis, Actin Polymerization, Internalization, Vacuole Formation