

Pathway And Network Enrichment Analysis Of Genes Associated With Protection Against Alzheimer's Disease



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Protective genes converge on biological pathways involved in lipid metabolism, neuroinflammation, and synaptic resilience. These findings provide new insights into the molecular mechanisms of Alzheimer's disease and identify promising targets for precision medicine.

INTRODUCTION

METHODS

RESULTS

CONCLUSIONS

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Alzheimer's disease (AD) is a progressive neurodegenerative disorder characterized by cognitive decline and dementia. Its pathogenesis is multifactorial and involves neuroinflammation, β -amyloid deposition, tau pathology, and genetic susceptibility.

While risk genes such as **APOE**, **APP**, and **TREM2** have been extensively studied, recent evidence suggests that several genetic variants may confer protection against AD by reducing neuropathology, modulating inflammatory responses, and enhancing neuronal resilience.

Understanding these protective mechanisms may reveal novel therapeutic targets and strategies for precision medicine. Therefore, this study aimed to identify and characterize genes associated with protection against AD using bioinformatic pathway and network enrichment analyses.

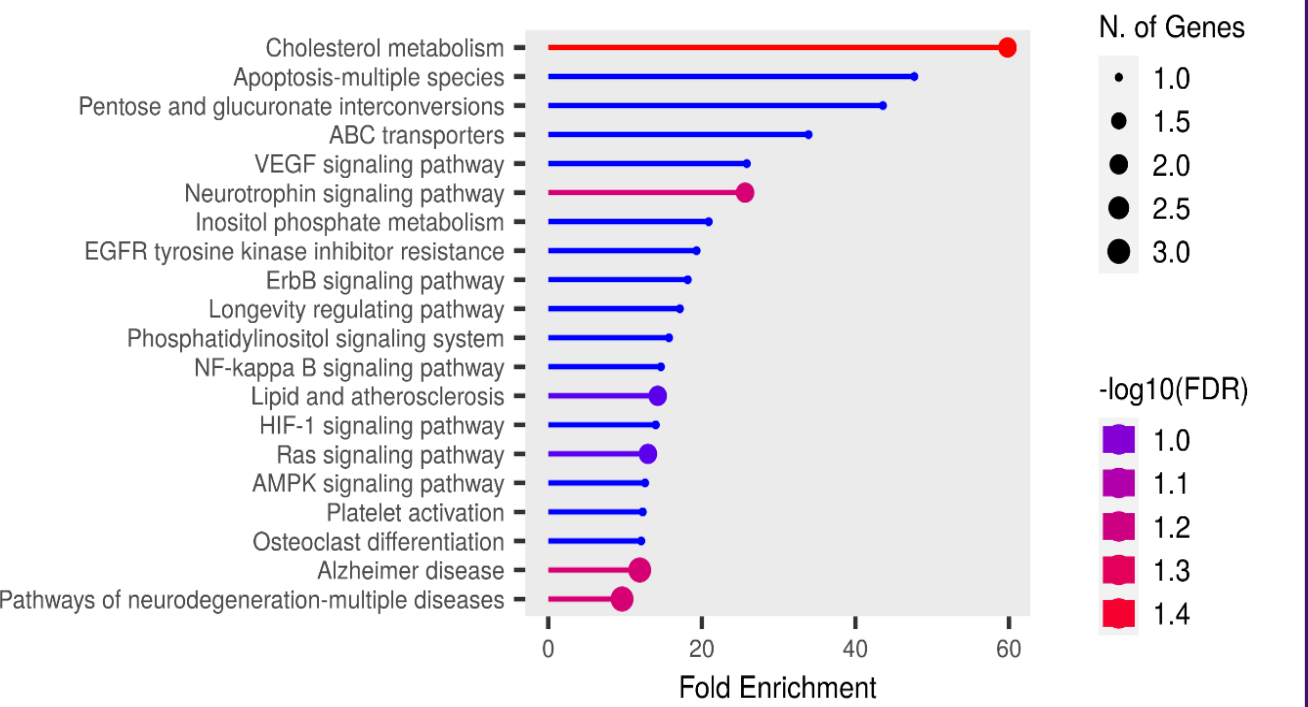
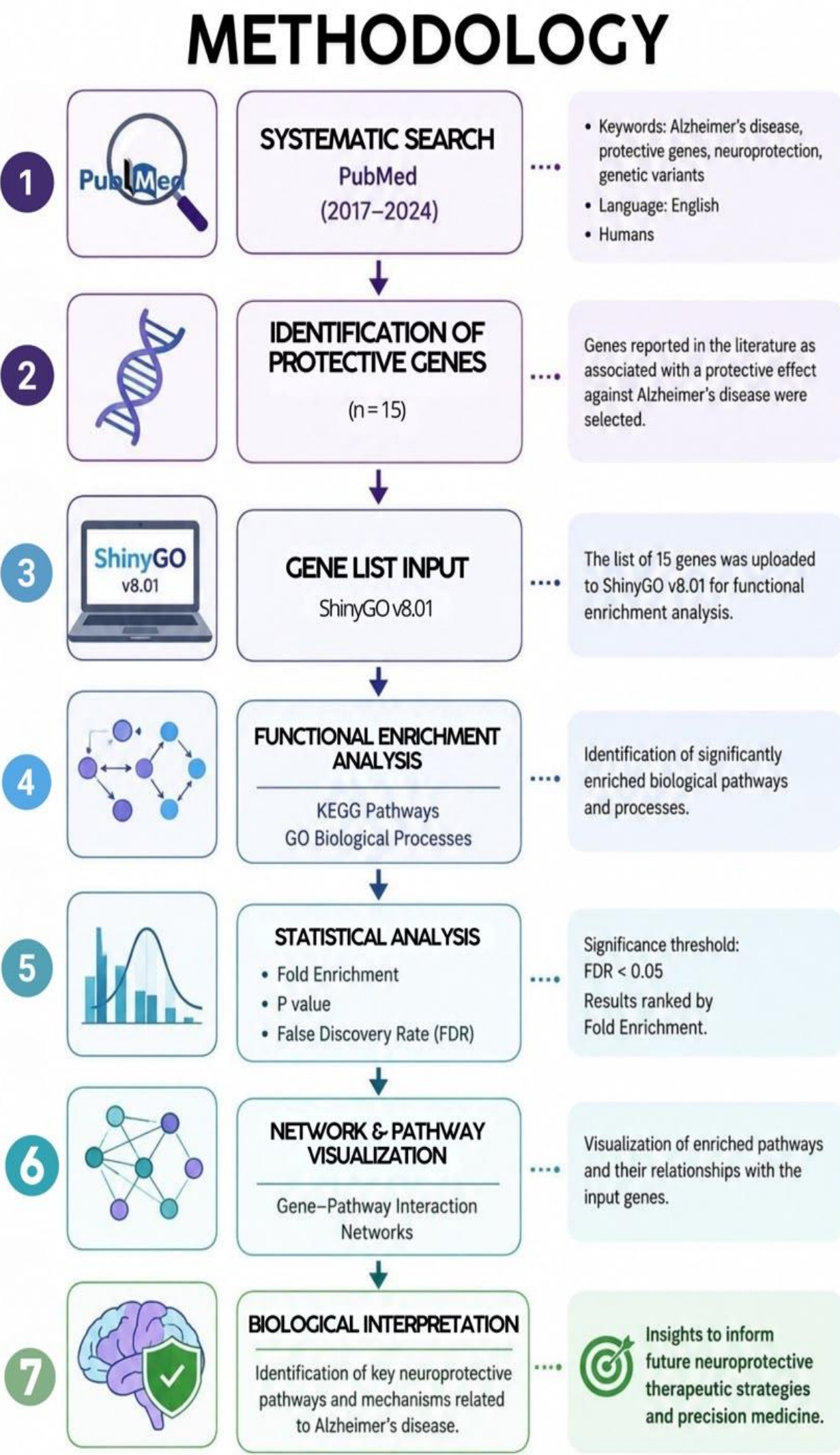


Figure 1. Analysis of biological pathway enrichment using ShinyGO v8.1. The most significant pathways are shown based on their fold enrichment, number of involved genes, and statistical significance (-log FDR).

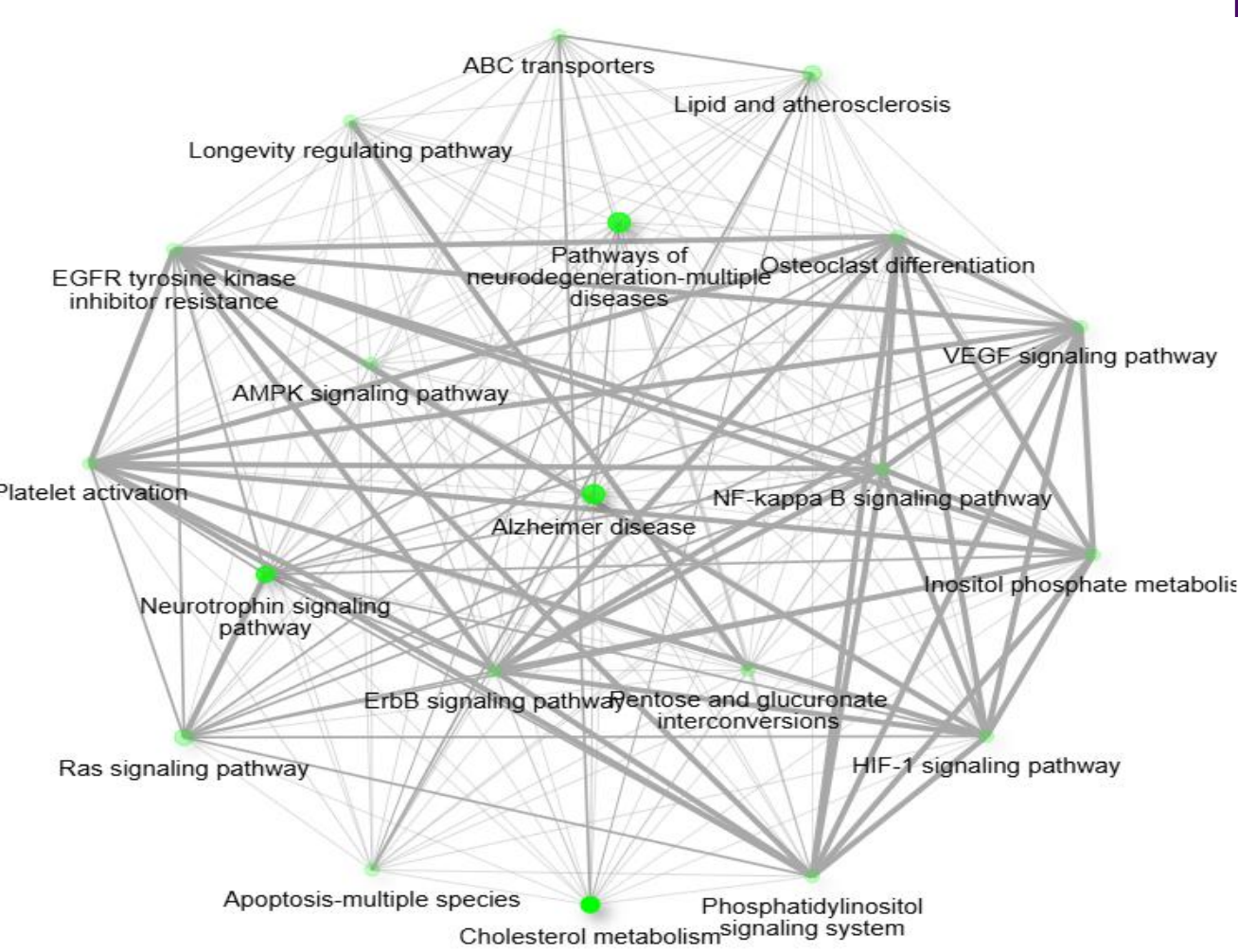


Figure 2. Network of biological pathways significantly enriched from genes associated with Alzheimer's disease.

Bioinformatic analysis identified protective genes associated with Alzheimer's disease, including **APOE ϵ 2**, **KL**, **ABCA1**, **PLCG2**, and **REST**, involved in cholesterol metabolism, synaptic plasticity, neuroinflammation, and neuronal survival.

These findings highlight the importance of protective genetic mechanisms in AD and support their potential as biomarkers and therapeutic targets for precision medicine. Further experimental validation is warranted.

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