Transcriptomic Profiling of Mitochondrial Dynamics Genes in Breast Cancer

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Introductions

Breast cancer is the most prevalent cancer worldwide and is associated with the second highest mortality rate (1). Multiple studies have demonstrated that mitochondrial dynamics–related genes play a critical role in cancer metastasis and proliferation. These genes regulate mitochondrial fission and fusion. Hernández-Alvarez et al.reported that the mitochondrial fission-related protein Drp1 is upregulated significantly in invasive breast cancer while MFN2 is downregulated (2). However, their expression across the different molecular subtypes of breast cancer remains largely unexplored.

Objectives

To explore how mitochondrial dynamics–related genes are differentially expressed in breast cancer subtypes, and how these patterns may guide therapeutic strategies and serve as biomarkers for metastasis

Methodology

PubMed

Literature review and gene curation

Gene Expression Omnibus

Curated microarray datasets of breast cancer subtypes

limma

Identification of DEGs & MDRGs
Adj p value < 0.05
LogFC > 2

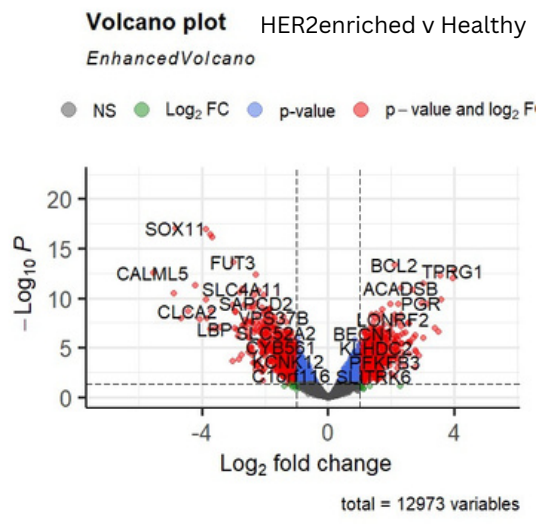
Merging and nornalising datasets

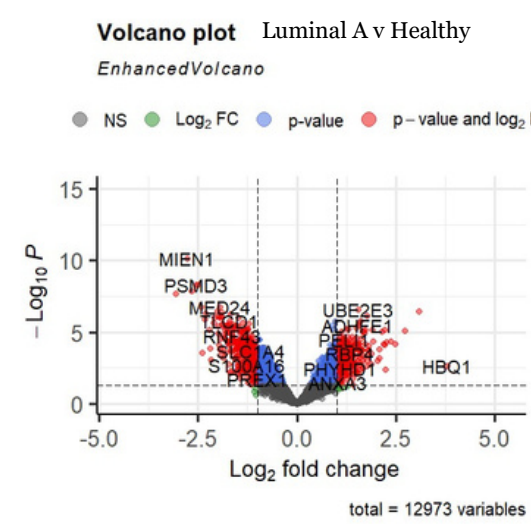
Enrichr

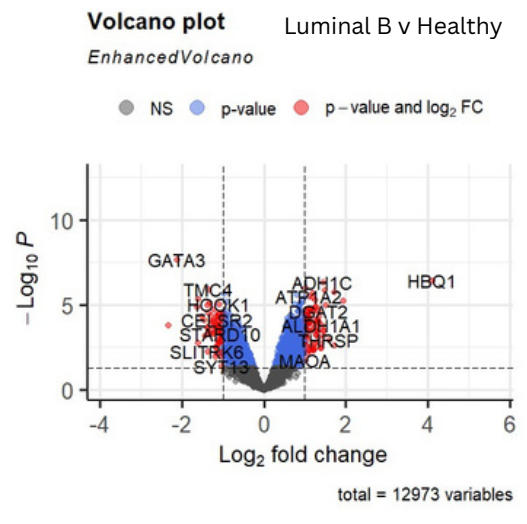
Pathway enrichment

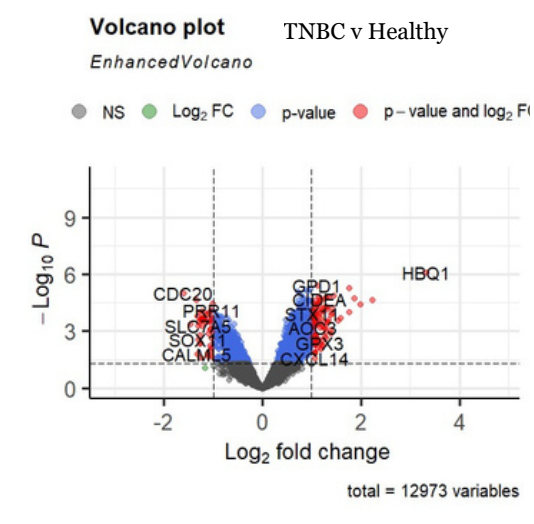
Interpretation of results

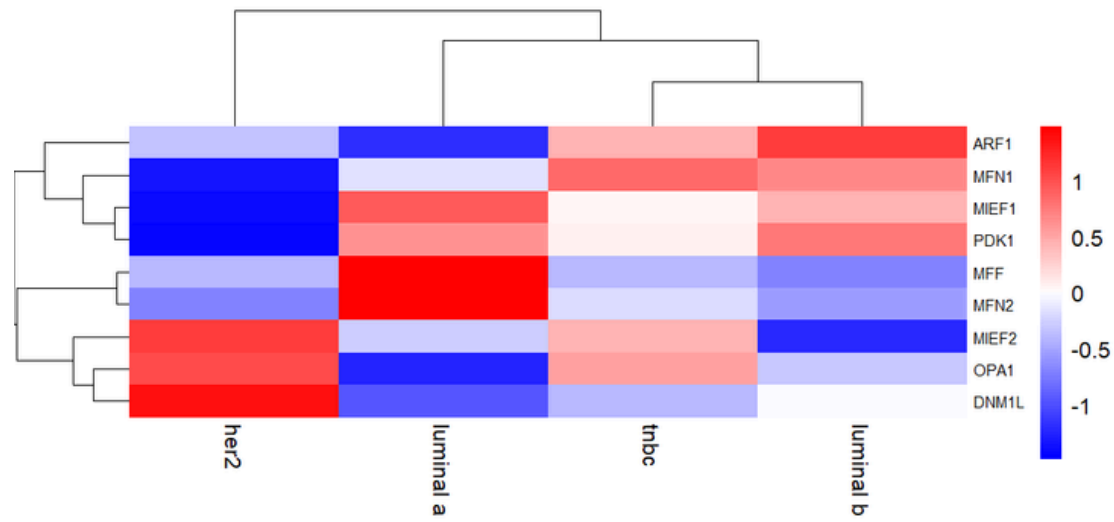
Result











Heatmap visualisation of MDRGs in Breast Cancer

Conclusion

The differential gene analysis validates our initial assumption that mitochondrial dynamics gene expression varies across breast cancer subtypes. It was found that MFN2 was downregulated across invasive and aggressive cancer subtypes, which can be used as marker for diagnosing breast cancer subtypes.

Way Forward

- Perform RNA-seq analysis of these genes and refine the methodology for greater accuracy.
- Integrate the proteomics and multiomics data to uncover deeper insights into the molecular mechanisms that drive these MDRGs.
- Study mechanisms by which specific proteins involved in mitochondrial dynamics participate in tumor growth.

References

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2. Hernández-Alvarez, M.I.; Zorzano, A. Mitochondrial Dynamics and Liver Cancer. *Cancers* **2021**, *13*, 2571. https://doi.org/10.3390/cancers13112571

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