Analysis Tutorial Prospectus

Melanie L Salas

Title

Investigating Heat Stress-Induced Disruption of LCA5L, MYBL1, and MAGEB4 Pathways in Spermatogenesis Using Multi-Omics Data

Research question(s)

How will heat stress affect gene expression affiliated to gene expression? How are chromatin structures adjusted in response to heat stress? Under heat stress, what is the role of protein aggregation and oxidative stress, and how does the loss of the key genes (LCA5L, MYBL1, and MAGEB4 amplify these effects?

Objectives(s)

This study will investigate how heat stress disrupts spermatogenesis through pathways of LCA5L, MYBL1, and MAGEB4, focusing on chromatin modifications, gene expression, and oxidative stress in germ cells. This will help identify the goal in molecular disruptions, regulation mechanisms of germ cell survival, and fertility preservation strategies.

Approach

To analyze differences in gene expression (DESeq2), chromatin accessibility, and enrichment in RNA-Seq and ATAC-Seq data, we will use R. R will also be employed to integrate multi-omics data and visualize the impacts of heat stress on germ cell health, while additional statistical analyses will assess oxidative stress and protein aggregation in heat-stressed knockout mice.

Selected references

Love, M. I., Huber, W., & Anders, S. (2014, December 5). *Moderated estimation of fold change and dispersion for RNA-seq data with DESEQ2 - Genome Biology*. BioMed Central. https://genomebiology.biomedcentral.com/articles/10.1186/s13059-014-0550-8

QY;, Y. G. L. Y. (n.d.). *Clusterprofiler: An R package for comparing biological themes among gene clusters*. Omics : a journal of integrative biology. https://pubmed.ncbi.nlm.nih.gov/22455463/

Limma powers differential expression analyses for RNA-sequencing and microarray studies | nucleic acids research | oxford academic. (n.d.). https://academic.oup.com/nar/article/43/7/e47/2414268

Gan M;Jing Y;Xie Z;Ma J;Chen L;Zhang S;Zhao Y;Niu L;Wang Y;Li X;Zhu L;Shen L; (n.d.). *Potential function of testicular micrornas in heat-stress-induced spermatogenesis disorders*. International journal of molecular sciences. https://pubmed.ncbi.nlm.nih.gov/37240155/

Life stage-specific effects of heat stress on spermatogenesis and oogenesis in drosophila melanogaster. Journal of Thermal Biology. https://www.sciencedirect.com/science/article/pii/S0306456524002195