

## Summary

- Is there a difference in markers of depression in male and female brains?
- Used qRT-PCR to determine the difference in *Hnf4* expression between male and female fly brains.
- In males, *Hnf4* expressed 1.14-fold lower relative to females.

## Abstract

Gene expression of *Hnf4 $\alpha$*  has been correlated to depression and stabilizing metabolism in humans. Differences in *Hnf4* expression between the brains of female and male *Drosophila melanogaster* (fruit flies) were investigated. Results from qRT-PCR showed that *Hnf4* mRNA was expressed 1.14-fold lower in males relative to female brains, revealing similar expression patterns between males and females.

## Introduction

### Hypothesis:

- *Hnf4* mRNA expression will be higher in females relative to male fruit flies.

### Model organism:

- Fruit flies have a short life span and share at least 75% of human disease-associated genes [1].

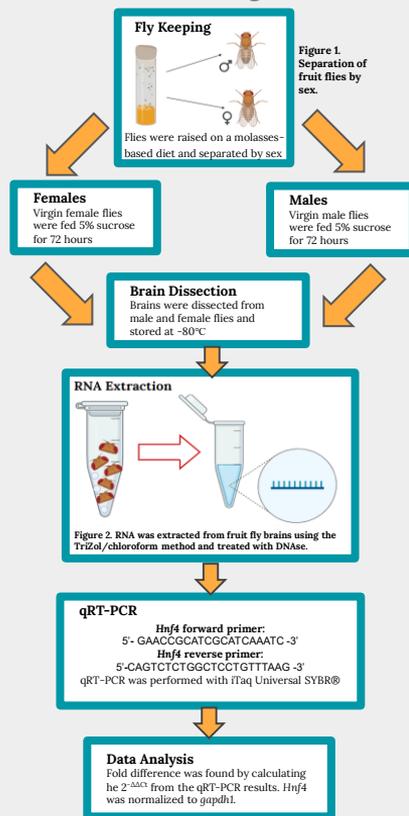
### Sexual dimorphism:

- Prevalence of depression in diabetic women is higher than that for diabetic men [2].

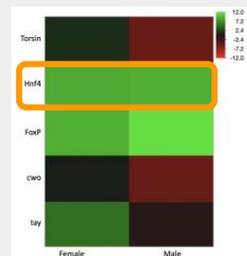
### Target gene:

- *Hnf4* has been shown to regulate gene expression levels in the brain, and relates to the physiological states underlying depressive episodes [3].
- *Hnf4 $\alpha$*  in humans exhibits several functions: fatty acid binding activity and regulation of transcription [4].
- *Hnf4 $\alpha$*  is linked to diabetes [5].

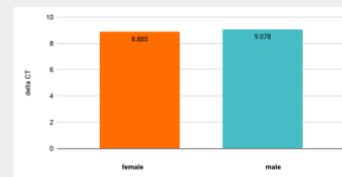
## Methodologies



## Results



**Figure 3. *Hnf4* is expressed at similar levels in female and male fruit flies.** Red indicates higher expression level and green indicates lower expression level. mRNA levels were normalized to *gapdh*. This heatmap was generated in JMP 14.



**Figure 4. *Hnf4* is expressed 1.14-fold lower in males relative to females.**  $\Delta CT$  values for *Hnf4* mRNA levels normalized to *gapdh* were 8.885 for females and 9.078 for males.



**Figure 5. Photo of QuantStudio 3.** QuantStudio 3 was the machine used to perform qRT-PCR reaction and measure fluorescence signals from SYBR green.

## Discussion & Conclusion

*Hnf4* was not differentially expressed between male and female *Drosophila melanogaster*.

- Male fruit flies express *Hnf4* mRNA slightly (1.14-fold) less than females.
- *Hnf4 $\alpha$*  is associated with diabetes and depression [6]. The hypothesis, based on research showing comorbid depression is higher in diabetic women, was supported by this data.
- The slight fold change between female and male fruit flies indicates similar *Hnf4 $\alpha$* -related diabetes and metabolic homeostasis in depressive states between the sexes.

mRNA levels of *Hnf4* were quantified and found to be relatively similar between the sexes in fruit flies. These results establish a baseline of non-sex specific gene expression of *Hnf4* for future stress response studies.

## Study Limitations & Future Directions

- No statistical analysis was performed.
  - Repeat study with more samples.
- Flies were only studied at the post-eclosion life-stage.
  - Expand study to various life stages.
- Samples were pooled; no individual variation was accounted for.
  - Study individual fruit flies.
- Gene Expression was only quantified using mRNA.
  - Quantify baseline *Hnf4* protein levels

## References

