hpo has sexually dimorphic gene expression in male and female Drosophila melanogaster.

Murakami K.1, Yang K.2, Kim E.3, Ghosh M.4, Suresh-Kumar N.5,6
1Oxford Academy, 2Abraham Lincoln High School, 3Portola High School, 4Homestead High School, 5Boz Life Science Research and Teaching Institute, 6UC San Diego Extension.

Summary
● Drosophila melanogaster (fruit flies) were exposed to 1000 mg/kg-day GenX for 7 days
● Measured gene activity hpo in Drosophila melanogaster (fruit flies) using qRT-PCR
● Females express significantly less hpo compared to males at baseline

Abstract
Male and female organisms often have different responses to stressors, but most science experiments are performed on male organisms. GenX is a chemical with no conclusive evidence as to its toxicity. The purpose of this study is to determine the sexually dimorphic expression of the hpo gene and its expression in response to GenX exposure. Female fruit flies upregulated hpo 2.96-fold (p=0.074) while males downregulated hpo 1.86-fold (p=0.256) after exposure to GenX. Males express hpo 16.98-fold more relative to females at control conditions (p=0.007). We conclude that females significantly downregulate hpo compared to males at baseline.

Introduction
Hypothesis
● After exposure to GenX, hpo will be upregulated in fruit flies
● hpo will not have different expression between males than females.

Drosophila melanogaster (fruit flies)
○ Sexually dimorphic
○ Short life cycle (10-12 days) & easily observable developmental stages
○ High conservation between fruit flies and humans

hpo
○ plays role in controlling cell proliferation
○ codes for serine/threonine kinase, which is part of the first step to a phosphorylation cascade that leads to cellular responses like apoptosis [1]
○ connected to tumor microenvironment, cancer growth & progression

GenX
○ chemical within the PFAS (per & polyfluoroalkyl substances) group found in food packaging, household appliances, and industrial products [2]
○ Unknown health effects and toxicity

Discussion
● hpo is involved in a pathway that when activated, leads to a slow down in cell growth and an increase in cell death, allowing for regulation of tissue size.
● hpo shows sexually dimorphic gene expression, with a 16.9 fold difference in male and female flies (p-value = 0.0069).
● hpo expression is not significantly altered when male and female flies are exposed to GenX.
○ experimental females compared control females (p-value=0.0739)
○ experimental males compared to control males (p-value=0.256)
● The increased hpo expression in male fruit flies may be a reason why male flies are smaller in size compared to females as it would reduce tissue growth in males.
● Exposure to GenX likely did not significantly alter cell proliferation or apoptosis in experimental flies.

Limitations & Future Directions
● The experiment only used one dosage of GenX (HFPO-DA) on Drosophila melanogaster. Varied doses should be used in the future to observe potential changes in gene expression.
● Only one model organism was used in this study. For future research on GenX we can use other organisms and compare the effects of GenX on gene expression to understand if these findings are consistent.
● D. melanogaster was exposed to GenX in its adult life stage. Future experiments can observe the effects of GenX exposure on earlier life stages to understand the effects GenX may have on development or growth.

Sources