كلية العلوم الصحية
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QATAR UNIVERSITY جامعة قطر

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Population, Health & Wellness

THE USE OF DROSOPHILA MELANOGASTER AS A MODEL ORGANISM TO STUDY THE EFFECT OF INNATE IMMUNITY ON METABOLISM

Abeer Mohbeddin, Nawar Haj Ahmed
Supervised by: Dr. Layla Y. kamareddine

[1]*Biomedical Science Department, College of Health Sciences, Qatar University, Doha, Qatar*

Abstract

Apart from its traditional role in disease control, our study provides evidence that suggest a role of the JAK/STAT innate immune pathway in regulating metabolic homeostasis. Owing to the importance of this "immune-metabolic alignment" in dictating a state of health or disease, a proper mechanistic understanding of this alignment is crucial in opening up for promising therapeutic approaches against a broad range of chronic, metabolic, and inflammatory disorders like obesity, diabetes, and inflammatory bowel diseases. Since the JAK/STAT pathway is evolutionary conserved between invertebrates and vertebrates, our potential findings in the fruit fly serves as a platform for further immune-metabolic translational studies in more complex mammalian systems including humans.

OBJECTIVES

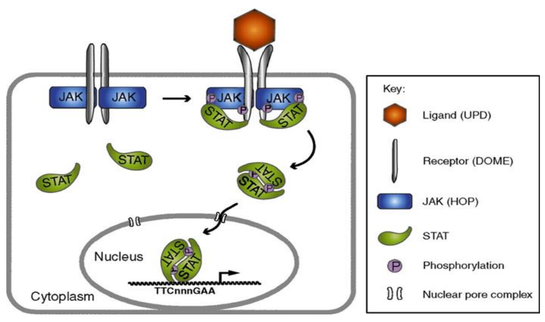
- Compare the body weight of *dome*^{G0282} and *stat92E*^{EY10528} mutant flies to *yw* control flies.
- Score for normal lipid storage and distribution in the fat body and gut of *yw*, *dome*^{G0282}, and *stat92E*^{EY10528} flies.
- Assess systemic glucose and triacylglyceride levels in *yw*, *dome*^{G0282}, and *stat92E*^{EY10528} flies.
- Detect relative gene expression of different metabolic peptide hormones (*Tk, AstC, DH31*) in *yw*, *dome*^{G0282}, and *stat92E*^{EY10528} flies.

Methodology

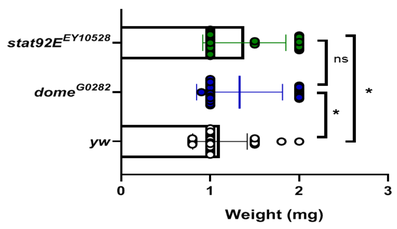
- *Drosophila melanogaster* husbandry and maintenance
- Organ dissection and fluorescence microscope.
- Nutritional assays (Glucose and Triacylglyceride).
- Relative gene expression of metabolic peptide hormone
- *Acetobacter* and *Lactobacillus* sp. colony forming unit (CFU) assay.
- Quantification and Statistical Analysis.

RESULTS

The JAK/STAT Signaling Pathway

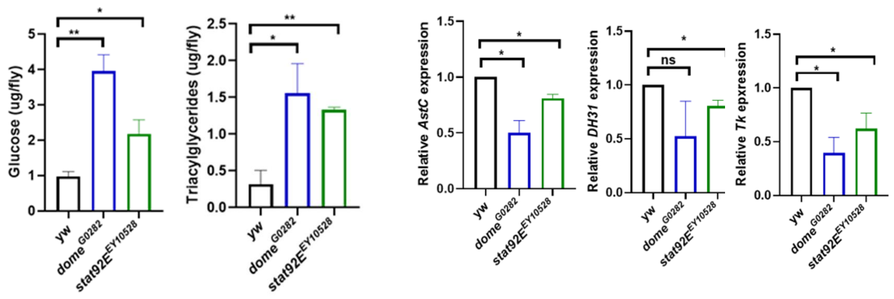


Gain of body weight in JAK/STAT pathway mutants

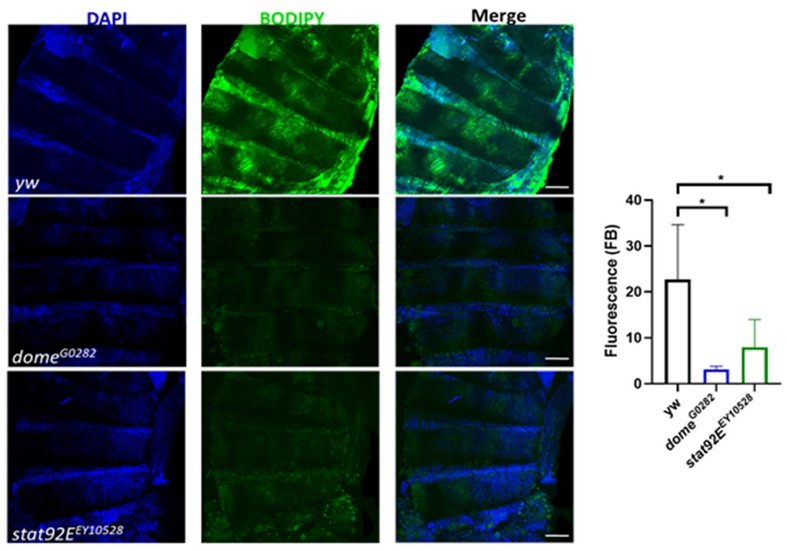


Elevation in glucose and triacylglyceride levels in JAK/STAT Pathway mutants

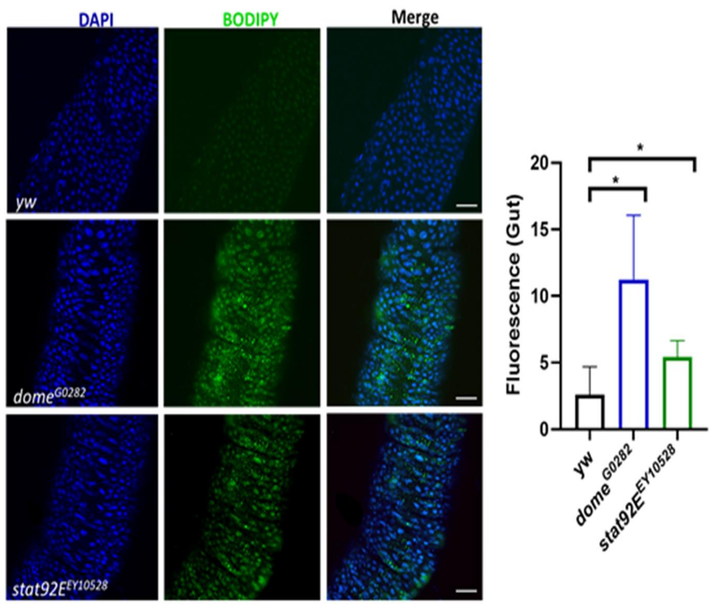
Down-regulation of metabolic peptide hormones expression in JAK/STAT Pathway mutants



Lipid depletion from the fat body of JAK/STAT pathway mutants



Irregular lipid accumulation in the gut of JAK/STAT mutants



Blocking JAK/STAT signaling alters the metabolic profile of mutant flies. Both *dome*^{G0282} and stat92E^{EY10528} mutants had increased body weight, lipid deprivation in their fat body (normal lipid storage organ), irregular accumulation of lipid droplets in the gut, significant elevation of glucose and triacylglyceride levels, and significant decrease in the relative gene expression of different peptide hormones (*Tk, AstC*, and *DH 31*) known to regulate metabolic homeostasis in flies.

Conclusion

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