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

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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 domeG0282 and stat92E+Y7128 mutant flies to yw control flies.
• Score for normal lipid storage and distribution in the fat body and gut of yw, domeG0282, and stat92E+Y7128 flies.
• Assess systemic glucose and triacylglyceride levels in yw, domeG0282, and stat92E+Y7128 flies.
• Detect relative gene expression of different metabolic peptide hormones (Tk, AstC, DH31) in yw, domeG0282, and stat92E+Y7128 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

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

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

Irregular lipid accumulation in the gut of JAK/STAT mutants

Conclusion

Blocking JAK/STAT signaling alters the metabolic profile of mutant flies. Both domeG0282 and stat92E+Y7128 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.

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References