The Use of Drosophila melanogaster as a Model Organism to Study the Effect of Bacterial Infection on Host Survival and Metabolism

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ABSTRACT
Infection-induced metabolic alterations is of great interest to many researchers. Here, we addressed the effect of E.coli, S.enterica, and S.sonnei infection on altering metabolic homeostasis of an infected host using the Drosophila melanogaster (DM) fruit fly model.

Our results revealed that both E.coli and S. sonnei were able to colonize the host gut and reduce its life span. Also, these orally infected E.coli and S. sonnei flies exhibited an alteration in the normal mobilization of lipids from the gut to the fat body, an increase in glucose and triglyceride levels, and a down-regulate in the expression of different peptide hormones (ActA, DHR1, and Tk) known to regulate metabolic homeostasis in flies. On the contrary, S.enterica was unable to colonize the intestine of host; therefore, the metabolic status of S.enterica infected flies was unaltered.

INTRODUCTION
Large body of evidence have shown that an individual’s array of commensal and pathogenic microbes contribute to chronic metabolic diseases such as obesity and diabetes. Therefore understanding different facets of host-pathogen cross-talk is imperative for defining the molecular bases of such metabolic disorders.

The huge similarity between a fruit fly and a mammalian intestine, along with the simplicity of a fly’s signaling system as compared to that of mammals, and to its readily available genetic tools, make it a model organism of choice.

Here, we show an effect of S.sonnei, S.enterica and E. coli intestinal pathogenic infections on altering the metabolic status of an infected host.

RESULTS

Life span of infected Drosophila melanogaster flies

Gut colonization of enteric pathogens in infected flies

Lipid depletion from the fat body of E. coli and S. sonnei infected flies

Irregular lipid accumulation in the gut of E. coli and S.sonnei infected flies

Elevated glucose and triglyceride levels in E. coli and S.sonnei infected flies

CONCLUSIONS

- Infection with E. coli and S. sonnei (two gastrointestinal tract disease causing agents) disrupt many metabolic parameters in a host including normal lipid distribution and storage, and systemic glucose and triglyceride levels.

- This metabolic alteration in E. coli and S. sonnei infected flies is thought to happen through a differential down-regulation in the production and/or secretion of Tk, ActA, and DHR1 peptide hormones.

- Our findings serve as a foundation for future studies to develop profound implications that modulate the pathogenesis of gastrointestinal tract diseases, and open up for promising therapeutic approaches for infection-induced metabolic alterations.

REFERENCES


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