Postdoctoral Candidate Seminar

What's the buzz?
How the microbiota influences alcohol responses in Drosophila

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Symbiotic relationships between animals and their microbiota are ubiquitous in nature. The gut microbiota is a vast and diverse population of bacteria and other microbes that have a profound influence on many aspects of host physiology and health including immunity, metabolism, development, and behavior. Although we have an increasing appreciation for the role of the gut microbiota on host's brain function and behavior, we do not have a full understanding of the scope of physiologies and behaviors the gut microbiota can effect. More importantly, the molecular mechanisms by which the gut microbiota impacts host brain function are poorly understood. To address these problems, we employed a proteomic technique call Two-dimensional Difference Gel Electrophoresis (2D-DIGE) to examine the protein differences in *Drosophila* heads between conventionally-reared (CV) flies and axenic (AX) flies, those raised in a sterile environment.

In this work, we identify a number of head proteome changes associated with the loss of microbiota. We identified common changes between males and females, as well as gender specific proteome changes. One of these proteins, Alcohol Dehydrogenase (ADH) - a key enzyme in alcohol metabolism, is elevated in the heads of AX male flies. This observation suggested that AX male flies may have microbiota-dependent physiological and behavioral responses to alcohol. We show that AX males are significantly less sensitive to the locomotor and immobilizing effects of alcohol vapor than their CV counterparts. We can restore the sensitivity by reintroducing the microbiota in AX male flies, demonstrating an important role the microbiota in alcohol physiologies in *Drosophila*. Next we asked whether AX flies have a difference in alcohol food preference behavior. Our experiments suggests that AX flies have a higher preference for alcohol food relative to their CV counter-parts, consistent with elevated head ADH protein and altered alcohol induced physiologies in AX male flies.

Taken together, we propose a model where *Drosophila* alcohol induced physiologies and behavior are influenced in part by the gut microbiota's ability to modulate ADH protein expression in the fly. This work may provide a better understanding of *Drosophila* ecology and co-evolution with their gut microbiota and establishes a paradigm to further study the microbiota's role in disease predisposition and progression of alcohol abuse disorders.