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Fruit Fly: An Ideal Model for Studying Obesity Related Disorders

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Editorial

Obesity and obesity-associated metabolic disorders are becoming modern world health epidemic. Several nutrition labs across the globe are trying to understand the development and progression of this disorder and are employing several models for studying the complex nature of the disease progression.

Fruit fly (*Drosophila*) is an excellent model for studying obesity and obesity related disorders. There are several good reasons for this assumption primarily maintaining fly stock is fairly simple and large numbers of flies can be easily maintained in a modest amount of space. Genomic simplicity is another reason for choosing fruit fly as a model for investigation, the diploid fruit fly has four chromosomes that hold approximately 14,000 protein-coding genes compared to the twenty three human chromosomes that hold approximately 20,000 protein-coding genes. There are approximately 75% homologs of human disease-related genes in *Drosophila* and last but not the least several transgenic models are available for understanding the spatial and temporal control of gene expression. Hence, *Drosophila* is an excellent model organism to tease apart the intricate relationship between nutritional input and obesity.

The distinguishable feature in growing *Drosophila* larvae and studying food intake behaviour is phenomenal, for example, we continue to eat a tasty meal although we are satiated. Such human behaviour of hedonic feeding although not evidenced in *Drosophila* yet it's quite interesting to know how flies behave towards availability of food presences. Food intake occurs with synchronization of various responses superficial in nature like sensory stimuli of olfaction and gustation along with responses that are internal in nature like metabolic essentials as per food intake responses. The widespread nature of food intake and its related abnormalities along with different features of food intake mechanism represent interweaved complexities in eating behaviour. The major role about information regarding external and internal stimuli on feeding and starving conditions relies upon the reciprocation of internal and external signalling of neural circuits of feeding behaviour. As per the taste preference feeding behaviour of *Drosophila* is very much like human and some studies indicate that feeding mechanism for both adult and larval feeding present an inhibitory response if the taste of food is weird compared with the regular tasting food. Such starvation is noticed in well-fed flies however, long term starvation changes the food preference and compensatory food is accepted by the flies.

The intricate mechanism of regulation of food intake which regulates nutritional balance in *Drosophila* and other living being is very similar and is coordinated by the activities of several neuropeptides. *Drosophila* Neuropeptide F (dNPF), structurally related neuropeptide F (sNPF), corazonin, leucokinin (LK), drosulfakinin (DSK) and allatostatin A (AstA) all belong to the category of neuropeptide that work to regulate food intake conditions. The entanglement of different chemoreceptors, neuropeptides and homeostasis of metabolic situation is similar in *Drosophila* and other living organisms. From the available range of neuropeptide which works with the nature to elevate feeding mechanism, some work in completely opposite manner. When studying the molecular mechanisms of food intake in the central nervous system and whole body, investigators found that high fat diet and regular diet shows different transcriptome in head and bodies of both female and male flies. In female flies lipid metabolism grows up with changes in transcription in contrast to the male flies which shows negative regulation of glycoside hydroxylase activity and stress relation in genes. This observation suggests a sexual dimorphism and contrasting transcriptional address between female and male flies and possibly different characterization of functional and neuroanatomical work between the sexes.

From the summary above and the cited examples it is clear that *Drosophila* can be used as an ideal model for studying human diseases because of homology of human disease-related genes in *Drosophila*. Moreover, a wide spectrum of information about the behaviour towards feeding and different parameters which leads to feeding behaviour are available for the fruit flies. Several questions pertaining to the regulation of food intake, like misregulation of food intake signal and pathways that are involved in regulation of food intake both at the level of central nervous system and periphery need to be teased out. As we indulge more in finding out *why* and from *where* such responses occurs we may help to understand and possibly create a path to overcome one of the major cause of death that manifests in the form of obese condition.