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The negative effect of High Fat Diet on the olfactory system

in *Drosophila melanogaster*

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High-fat diet (HFD) often causes obesity, heart disease, cancer and it has detrimental effects
on the sensory system. In particular, sensory-mediated responses are crucial for maintaining
energy balance, as they are involved in a metabolic regulation; however, little is known about
the impact of HFD-induced stress on sensory system. We have used a *Drosophila melanogaster*
model to gain insight on how HFD-induced stress affects physiological, behavioral, and
transcriptional changes related with olfactory and nutrient-related signaling. We demonstrated
that lifespan and locomotor activity in HFD-treated flies decreased and that olfactory sensitivity
and behavioral responses to odorants were changed. Olfactory sensitivity to eight of ten
odorants after 14 days on HFD treatment were reduced, while behavioral attraction was
increased to benzaldehyde and 1-hexanol in flies that were treated with HFD for 7 days. This
behavioral and physiological modification by HFD treatment was accompanied by a significant
decrease in DmOrco gene expression in a peripheral olfactory organ, suggesting that is could
be involved in the action of metabolic and sensory signal. Gene expression profiles of
antennae showed significant differences on the olfactory receptors, odorant-binding proteins,
and insulin signaling. Our results suggested that olfactory sensitivity and behavioral
responses to HFD-induced stress are mediated through olfactory and nutrient-related signaling
pathways.