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 EXPAND Mentor

## The role of a polyunsaturated-fatty-acid-rich diet for cold adaptation in *D. melanogaster*

Itay Budin/Budin Lab (2022-2023)

### What you will do

We are interested in understanding how lipids transferred in diet play a role in the ability of multicellular organisms to adapt to cold temperatures. Dietary lipids (for example fats) get integrated into cells as important building blocks of the cellular membrane. In unicellular organisms that contain specific enzymes, lipids with polyunsaturated fatty acids (PUFAs) provide stiffness to cellular membranes to keep a physiological environment inside the cells under cold temperatures. This phenomenon has been seen in synthetic systems, too. The multicellular organism *D. melanogaster*, or fruit fly, lacks the enzymes to create PUFAs *de novo*, yet it is able to adapt to cold temperatures and overwinter in certain places of the world. *Drosophila* obtains nutrients from yeast. We have found that *Drosophila* associates highly with PUFA producing yeast during cold months, and with non-PUFA producing yeast during warm months, in the wild. We have also found that PUFAs synthesized in yeast are transferred to *Drosophila* through diet, allowing *D. melanogaster* to adapt to cold temperatures.

**We are interested in identifying the volatiles produced by PUFA-producing yeast cells that signal *Drosophila* for PUFAs presence. We are also interested in identifying the molecular pathways, in *Drosophila*, that drive the identification and transfer of PUFAs from yeast to fruit flies.** There are two open opportunities for assisting in this project. One opportunity will assist in introducing mutations on genes involved in volatile production in yeast. The second opportunity will assist in screening *D. melanogaster* mutants to identify the pathway involved in PUFA-rich diet selection under cold temperatures.

### Skills you will acquire

- Yeast as a model organism: growth curves, cloning, PCR and gel electrophoresis
- *Drosophila* as a model organism: husbandry and genetic and molecular tools
- Familiarity with lipids and their role in cellular maintenance