Drosophila as a Platform for Drug Discovery

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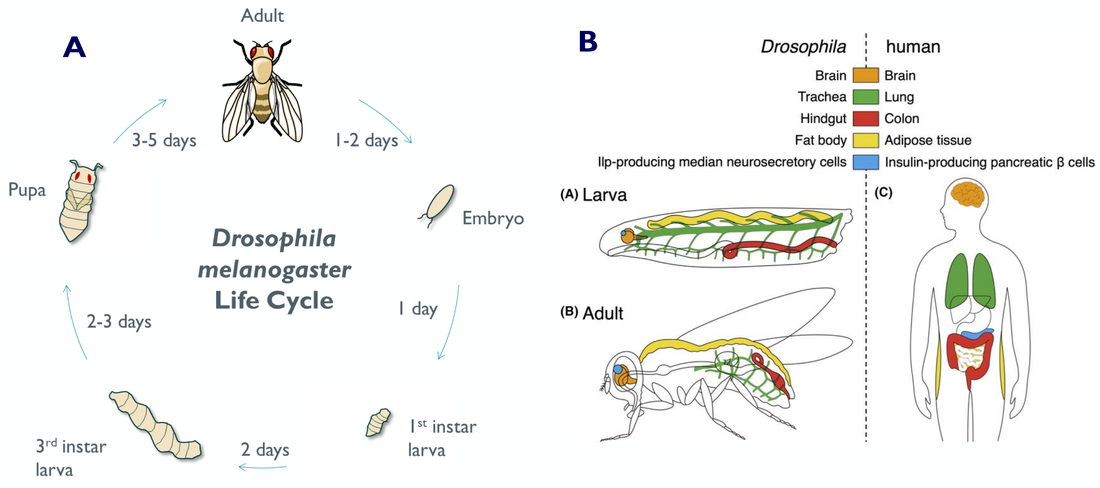
Introduction

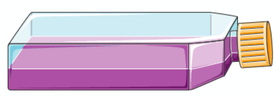
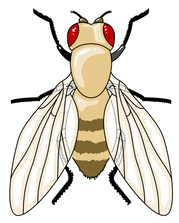
Drosophila melanogaster are a commonly used in genetic research. Their small size, quick lifecycle (A) and an established genetic toolkit make them ideal to research conserved processes. With 75% conservation between disease causing genes, as well as conserved biological structures and processes (B), *Drosophila* make an ideal model organism in which to study human disease.

As *Drosophila* have been used as a model organism for over 100 years, there is a vast toolkit readily available. This includes a fully sequenced genome, the ability to easily create mutant tissue with both spatial and temporal control, as well as techniques such as CRISPR.



A) Schematic representing the *Drosophila* life cycle. Adult flies lay embryos, which hatch into larvae. These larvae undergo moulting until they are third instar, at which point they pupate and undergo metamorphosis to hatch into an adult fly. B) *Drosophila* share many characteristics with humans at both larval and adult stages (Yamamura et al, 2021).

Benefits of using *Drosophila* for drug discovery

	Cell culture	*Drosophila*	Mouse
Model			
Homologous Gene %	Up to 100%	75%	85%
Cost	Low	Low	High
Speed of model development	Fast	Fast	Slow
Speed for screening	Fast	Fast	Slow

Traditionally, *in vitro* screens have been used to identify potential therapeutic hits, with these leads often being directly tested in preclinical rodent models. Not only are whole organism drug screens often time consuming and costly, but lead compounds also often fail at the preclinical stage due to adverse effects in a fully functioning organism which are not easily elucidated in cell culture.

With **75% conservation with human disease-causing genes**, *Drosophila* provide a way in which to screen compounds in a **whole organism** against a wide variety of human diseases, including cancers and neurodegenerative disorders. Their **short life-cycle**, small size and **vast genetic toolkit** make *Drosophila* more **affordable** than mammalian research models. Furthermore, *Drosophila* produce hundreds of offspring throughout their lifetime, allowing us to test many drugs in parallel in a short timeframe, allowing for a **huge sample size** in comparison to rodents resulting in **strong statistical power**.

How do flies fit into the drug discovery pipeline?

The drug discovery pipeline typically initiates with target validation using *in silico* and *in vitro* models, with candidate compounds being screened in cell culture. After lead generation and identification, compounds are put into preclinical models (often rodents) where compounds can have a very different effect in a whole organism versus cell culture. *Drosophila* provide a bridge between *in vitro* and preclinical models, allowing for compounds to be screened in a whole organism at a fraction of the cost.

Drosophila capabilities

VAST GENETIC TOOLKIT

We will work with you to determine the best approach to model your disease of interest

SCREENING

Screening of compounds at all developmental stages

ANALYTICAL TECHNIQUES

Broad range of analysis techniques

- We provide a unique opportunity to screen potential therapeutics in *Drosophila melanogaster*.
- Close contact with the client is maintained throughout a project, ensuring the data is obtained in a cost-effective, efficient manner.
- Experimental designs tailored based on the clients' needs that can help advance the drug discovery process and narrow down lead candidates before progressing to a preclinical model.