

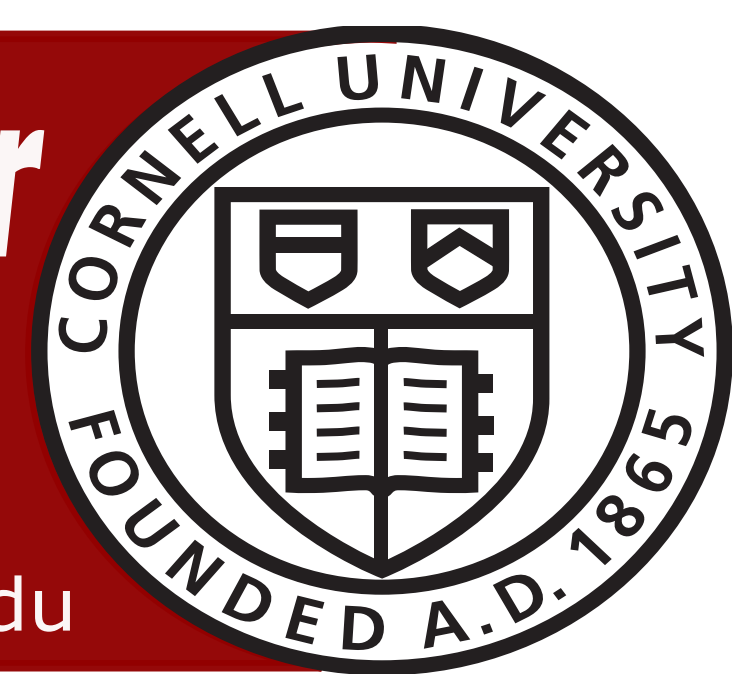
Cellular heterogeneity underlying poly-functional fat body tissue in *Drosophila melanogaster*

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Introduction

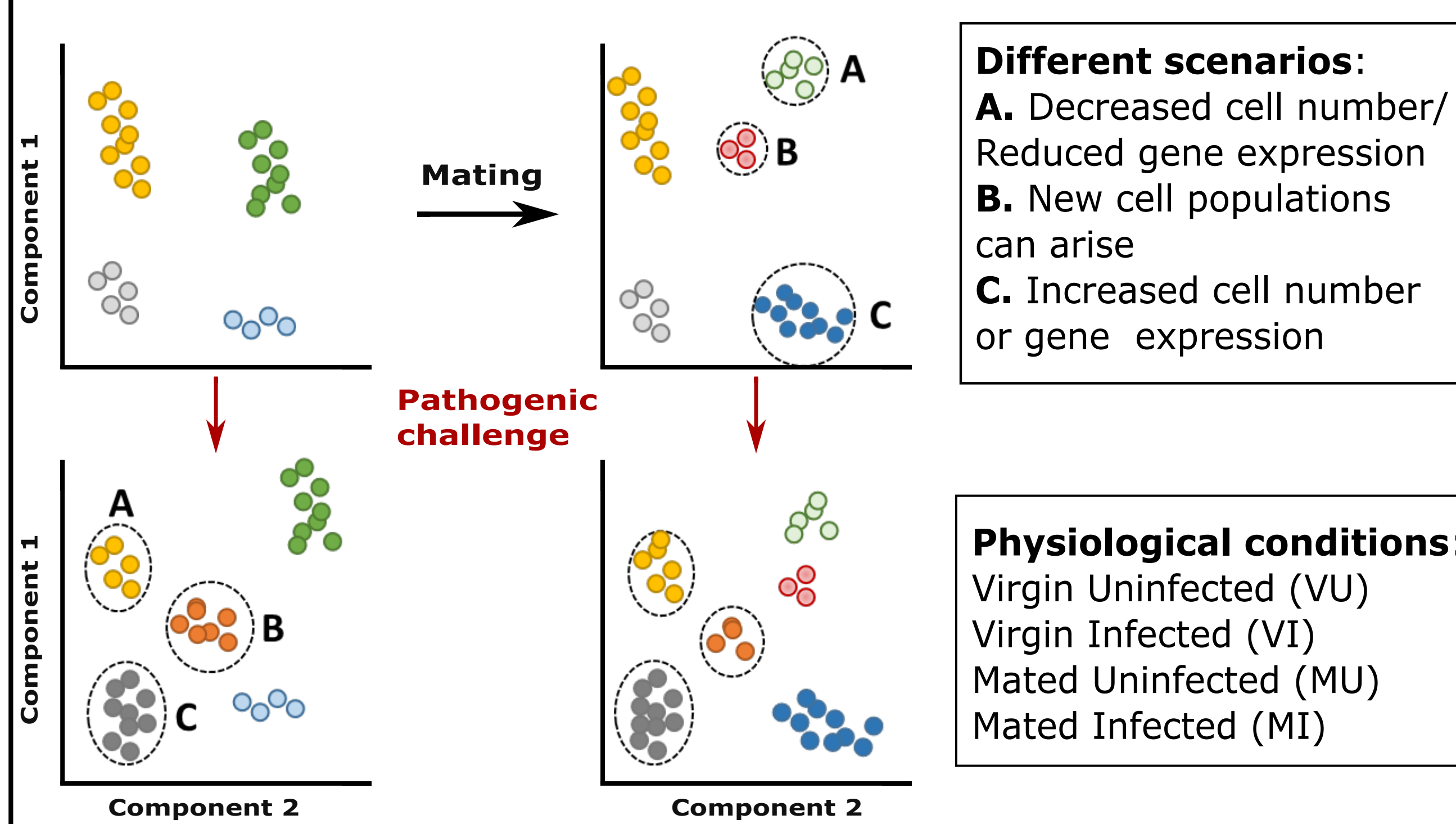
Fat body tissue is a multi-functional tissue.
In *Drosophila melanogaster*, fat body tissue is involved in including

- reproduction,
- immunity, and
- nutrient metabolism

However, we do not understand how polyfunctionality of the fat body tissue is maintained.

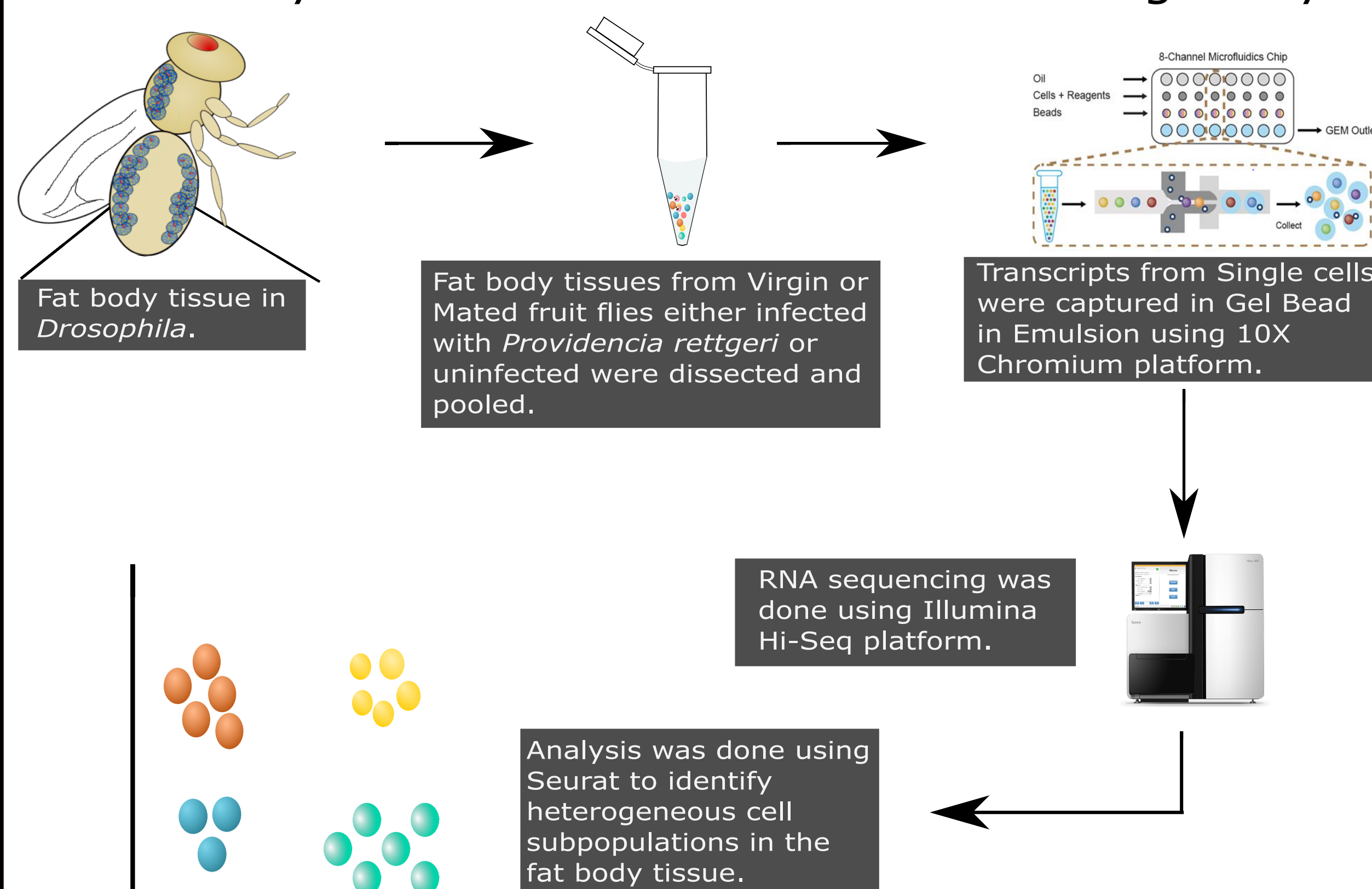
Hypothesis

Physiological conditions have differential impact on distinct subpopulations.



Experimental Approach

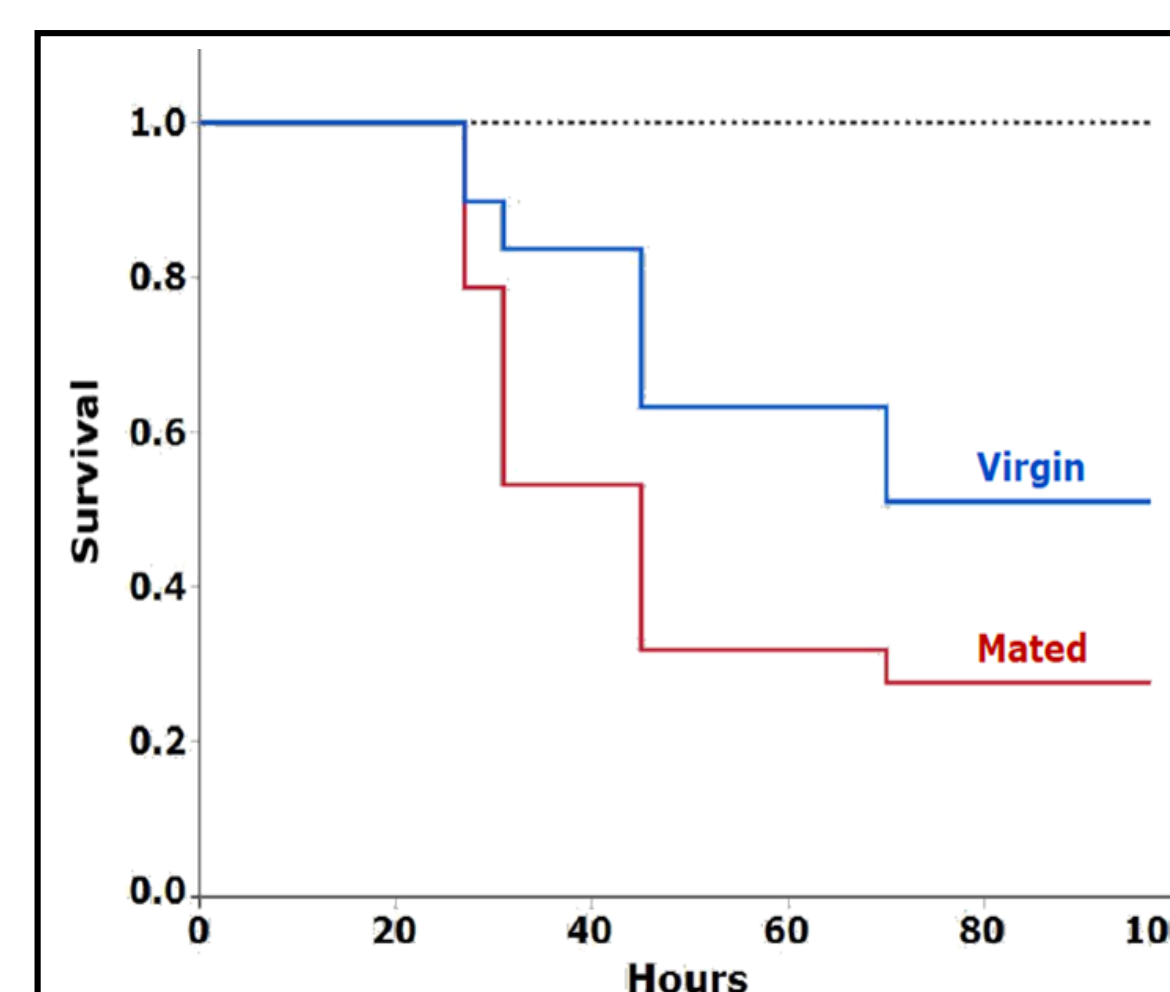
We used **single-cell RNA sequencing** on fat body cells to understand tissue heterogeneity.



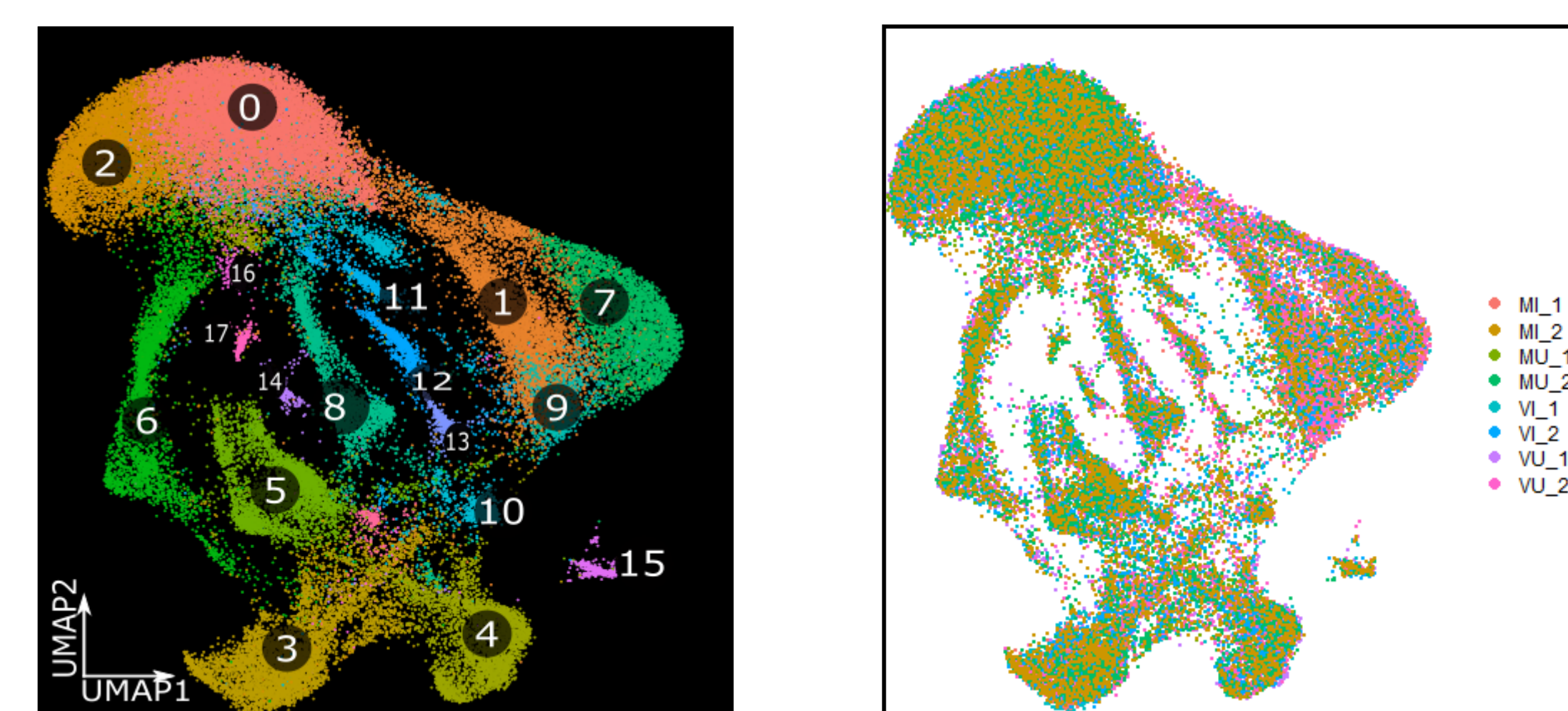
Conclusions

- (1)*Drosophila* fat body tissue consists of heterogeneous subpopulations
- (2)No new subpopulations arise under different physiological conditions
- (3)Gene expression changes upon infection are cluster-specific
- (4) Insulin signalling may have a role in lower immunity in mated females
- (5)Trade-offs may be mediated via higher expression of Yp1 and vitelline membrane proteins

Results

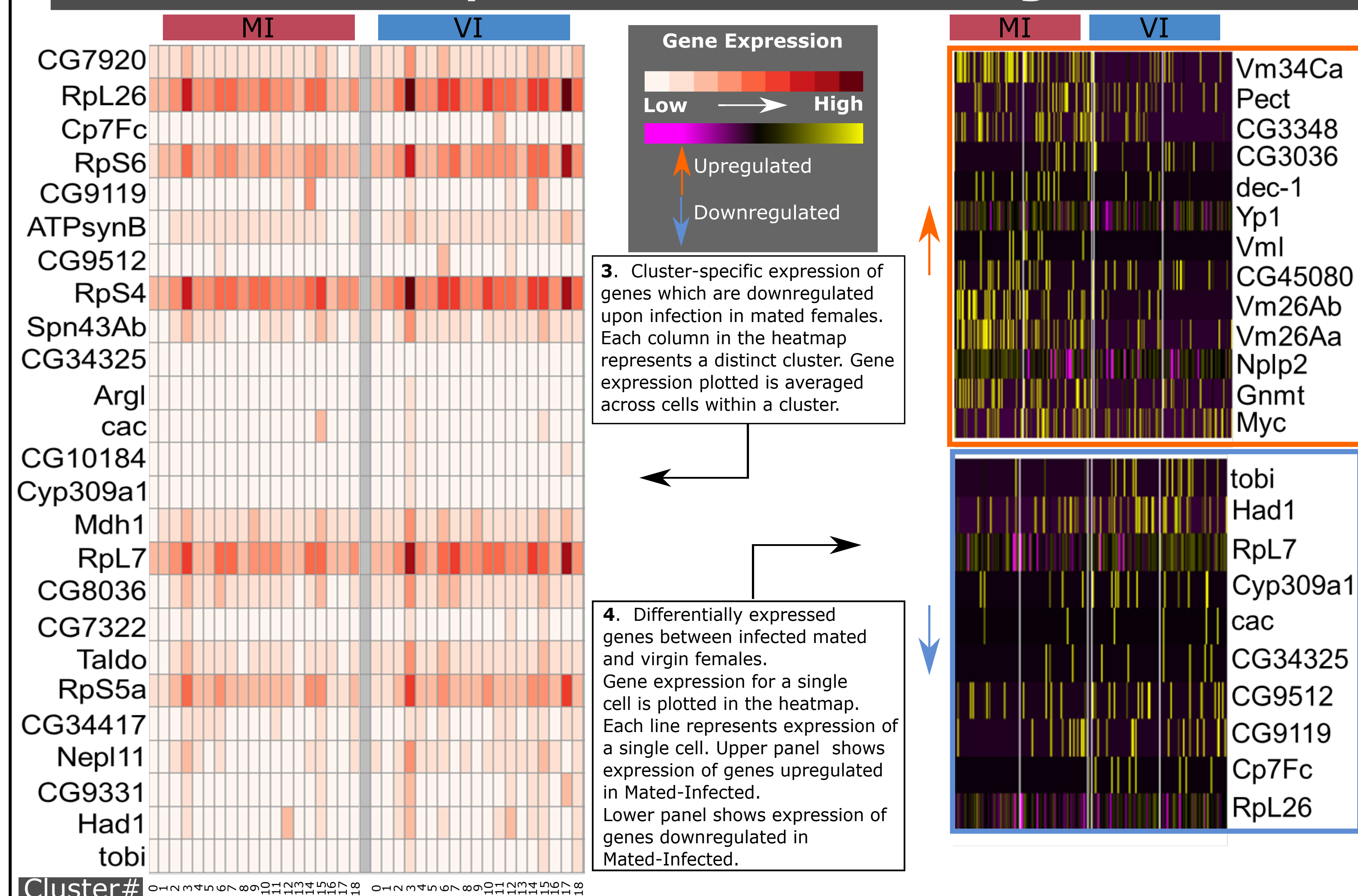


1. Higher post-infection survivorship in Virgins compared to Mated females upon challenge with bacteria *Providencia rettgeri*

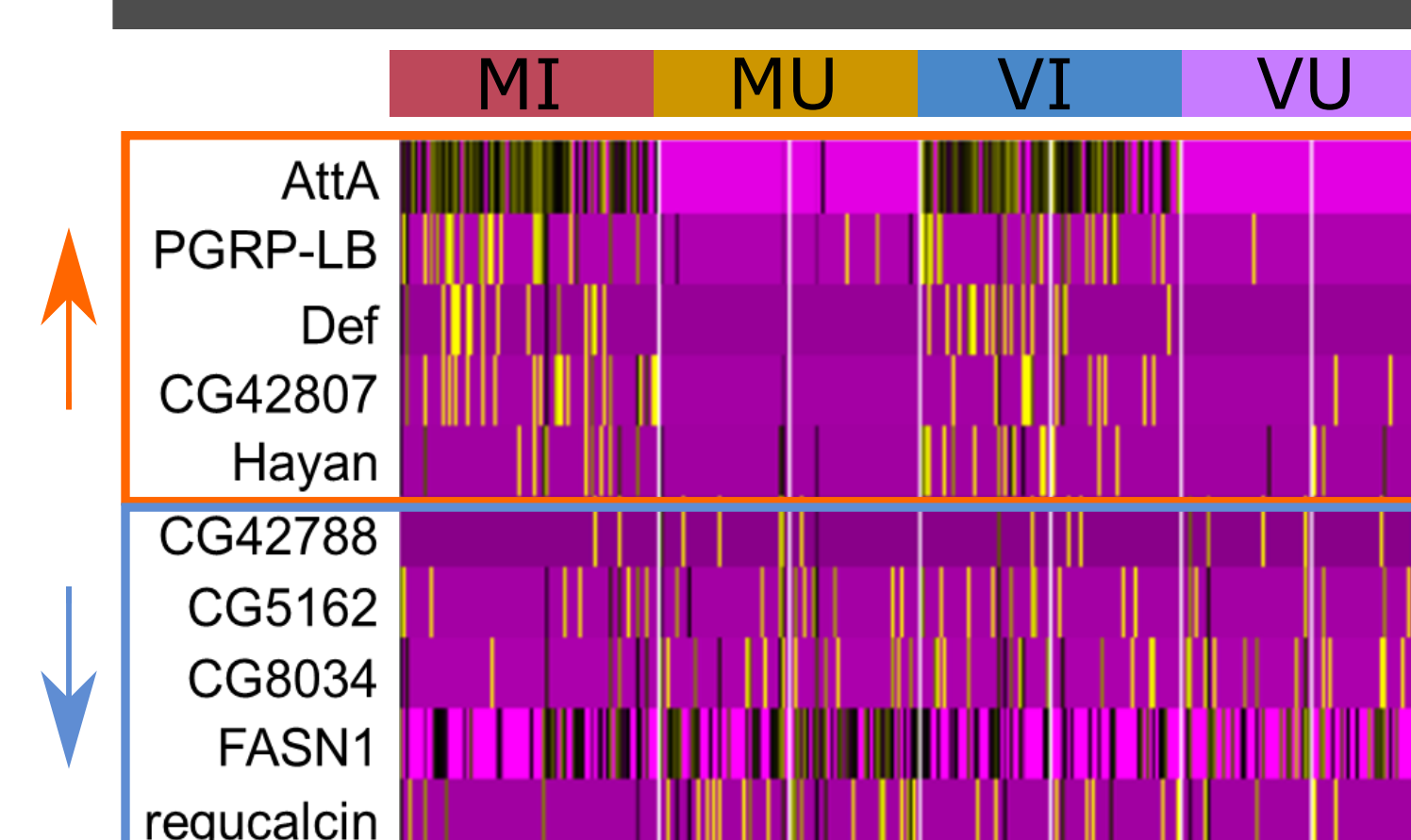


2a&2b. Heterogeneity in the fat body tissue of female *D. melanogaster*. Plots show 2-D projection of Single-cell data integrated over four different treatments: VU, VI, MU and MI. Each dot represents a single cell. Different numbers indicate distinct clusters present in the tissue. 2b shows cells colored by different treatments.

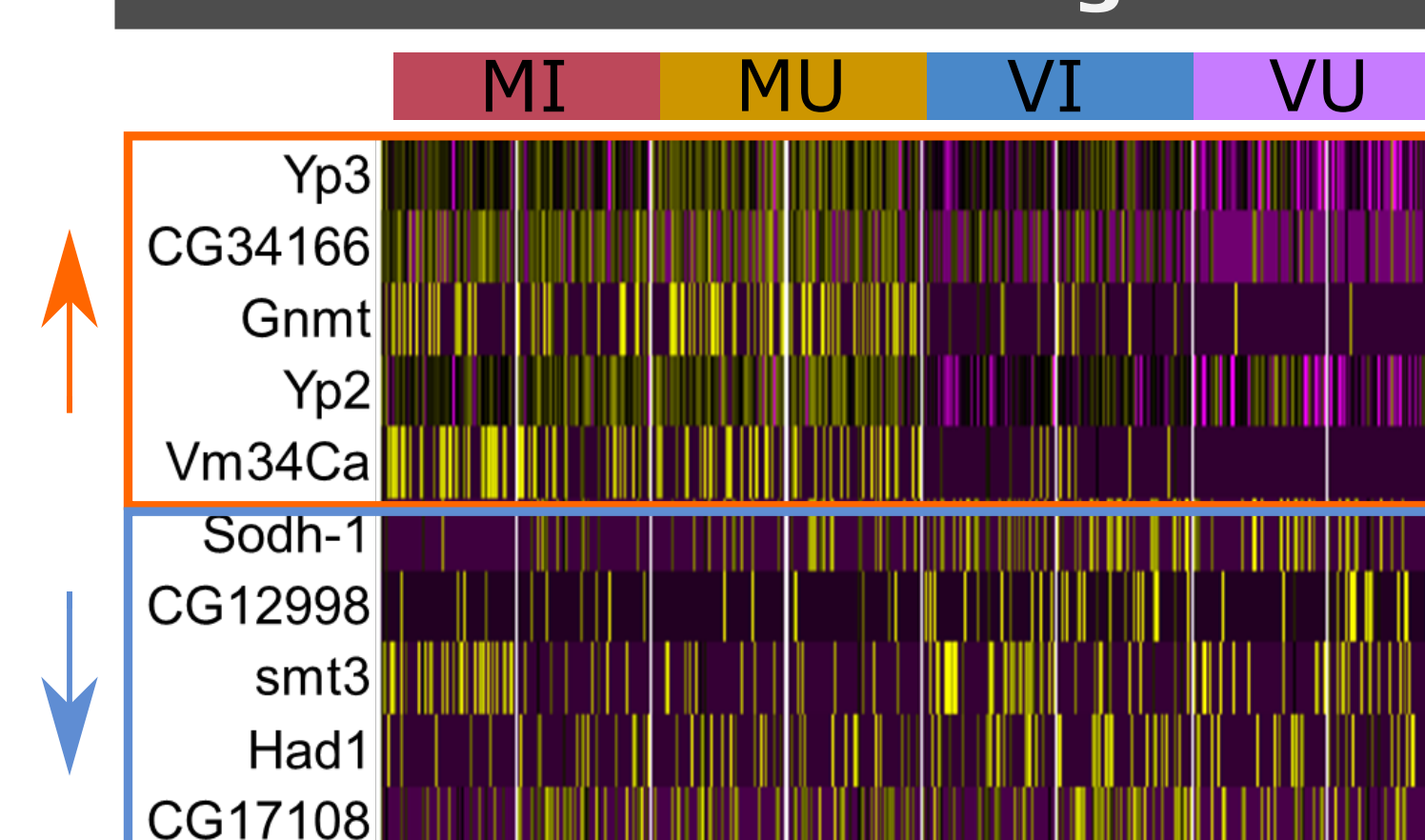
Differential response to Infection of Virgin & Mated



Effect of Infection



Effect of Mating

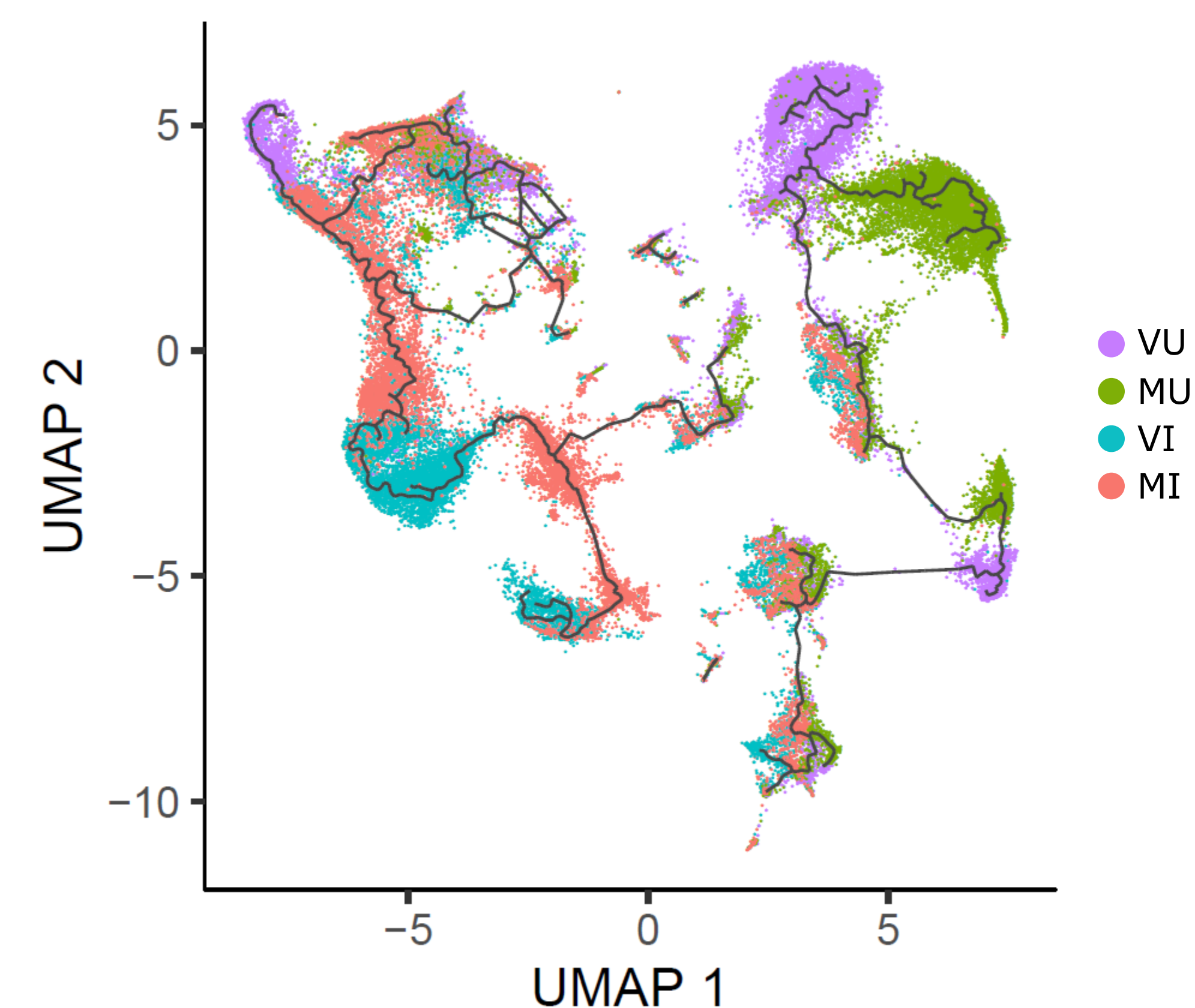


References

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- Schoettl T, Fischer IP, Ussar S. Heterogeneity of adipose tissue in development and metabolic function. Journal of Experimental Biology. 2018 Mar 7;221(Suppl 1):jeb162958.
- Butler et al. Integrating single-cell transcriptomic data across different conditions, technologies, and species. Nature Biotechnology (2018).

Future Directions

Using pseudo-time analysis, understand transitioning of cells from one treatment to another



Trajectory of cells plotted using Monocle3. Infected cells are seen as a group separated from uninfected.

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