Gene expression responses to crowding in *Drosophila*

1. Background

➡ Density-dependent effects limit the population development of all organisms, although the effects of density dependence upon gene expression are poorly understood.
➡ Microarrays offer the opportunity to quantify ecological effects on global gene expression.
➡ *Drosophila melanogaster* is frequently used as a model organism for the innate immune system and is reared in crowded conditions.

2. Objectives

➡ Induce stress in *Drosophila melanogaster* through larval crowding before using microarrays to determine any subsequent changes in gene expression.
➡ Perform quantitative PCR on selected target genes to study the effect of pathogen challenge, with focus on the innate immune system.

3. Lab Work

➡ High, medium and low densities of breeding adult pairs were given 24 hours to lay eggs.
➡ These eggs counted prior to being left to incubate.
➡ The numbers of individuals at each life stage in each treatment were recorded at several time points for growth rate comparisons.

4. Experimental Design

➡ Two biological replicates used in microarray experiments.
➡ Pooled samples of ten third instar larvae used for analysis on 12 microarrays. (Fig. 1)
➡ Agilent 60-mer two-colour oligo arrays used for higher quality results than cDNA arrays.

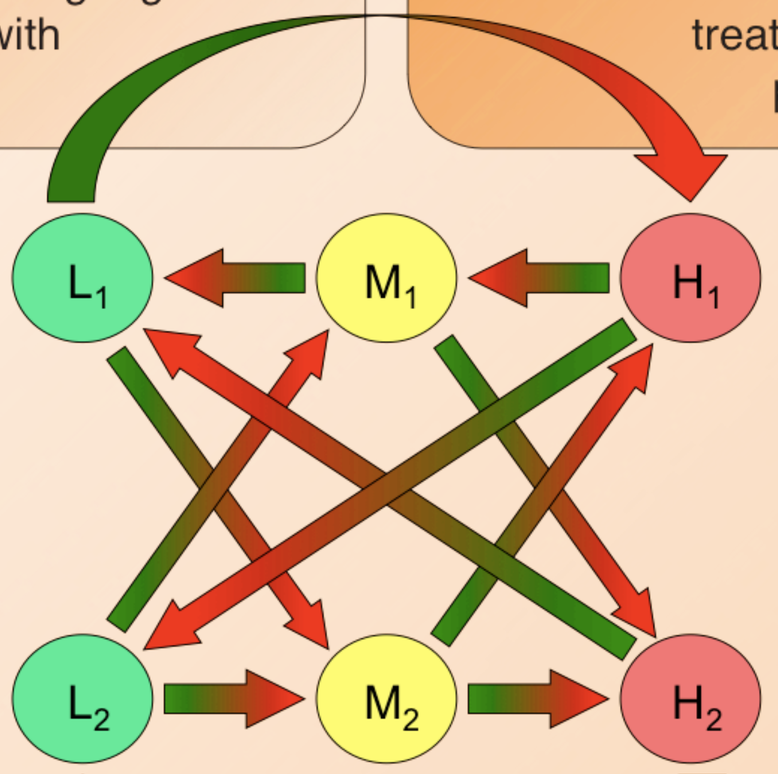

Fig 1. Arrows represent microarrays where green tails are Cy3 labeled and red heads have Cy5 labeling.

5. Results

➡ Crowding the larvae resulted in differential growth rates. (Fig. 2)
➡ qPCR was performed on target genes including *Actin 79B*, *PPO*, *HSP70*, *Drosomycin* and *DCV1*.
➡ *Actin 79B* and *HSP70* were up-regulated in newly emerged (48hr) against week old adults.

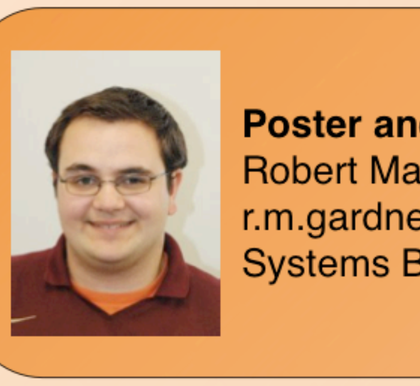

Fig 2. Larvae six days after the removal of adults from cultures - all at the same magnification (a) high; (b) medium; (c) low density treatments. (d) chart showing survival of eggs laid (number in parentheses) to various stages after 1 week.

6. Future Work

➡ A time course of gene expression for each of the samples would show variation in expression from the first larvae through to the adult flies across densities.
➡ Intra-specific competitions within life-stages can be developed further, leading to Leslie Matrix models.
➡ An extension to work on the honey bee *Apis melifera* is underway, relating to colony collapse disorder.

7. References

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