Juvenile Hormone in Male Courtship

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Introduction

In examining male wild-type *Drosophila melanogaster* mating with female flies, certain defined courtship behaviors were observed. The courtship behavior can readily be observed and quantified in a lab. The courtship index calculates the percentage of time spent by the male exhibiting any kind of courtship modality. Male specific proteins in specific brain neurons and circuits are required for normal male courtship behavior (Cachero et al., 2010). However, the Dauwalder lab has shown that circulating factors and a well-known developmental hormone (Juvenile Hormone, JH) regulate mating behavior (Wijesekera et al, 2016). In this research we aim to study the selective barrier that determines what factors signal through the blood brain barrier (bbb) to regulate the behavior of *Drosophilia melanogaster (*Hoxha et al., 2013*)*. The selective nature of the blood brain barrier is our current focus of interest because signal molecules communicate with the blood brain barrier to regulate the brain's functions, which we aim to detail.

Multi-Drug Resistance (Mdr) is a BBB protein. Juvenile Hormone Esterase (JHE) degrades Juvenile Hormone (JH). In this experiment *Mdr-Gal4* flies were crossed with *UAS-JHE* to knockdown JH in the bbb – *Mdr-GAl4; Gal80ts/UAS-JHE* flies. Gal80ts is temperature sensitive inhibitor of Gal4. At 18°C the Gal4 is inhibited and expression of JHE, is repressed ("uninduced flies"). At 32°C Gal80ts gets inactivated and no longer inhibits Gal4 and JHE, the JH degrading enzyme, is expressed ("induced flies"). The controls were the Wild-type (CS) crossed with each one of these elements: *CS(+)/UAS-JHE*, *+/MdrGal4; Gal80ts.*

Results

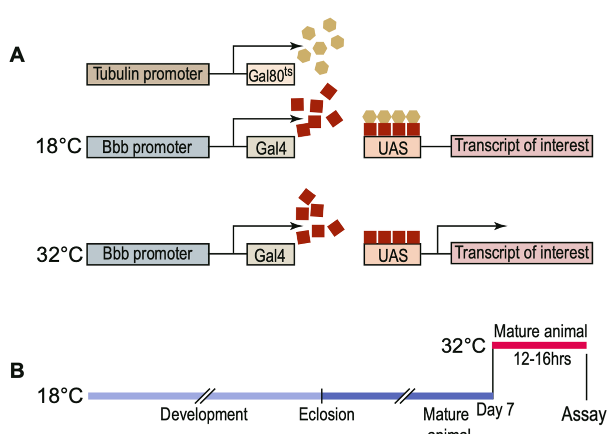

Fig. 1 Gal4/UAS/Gal80^{ts} System For Gene Expression

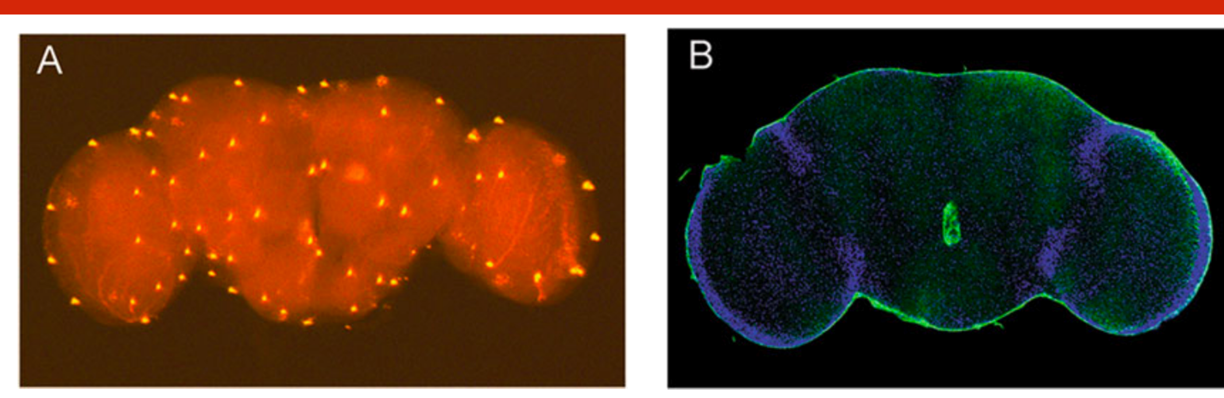

Fig. 2 Blood Brain Barrier of *D. melanogaster* and Nuclei Visualized

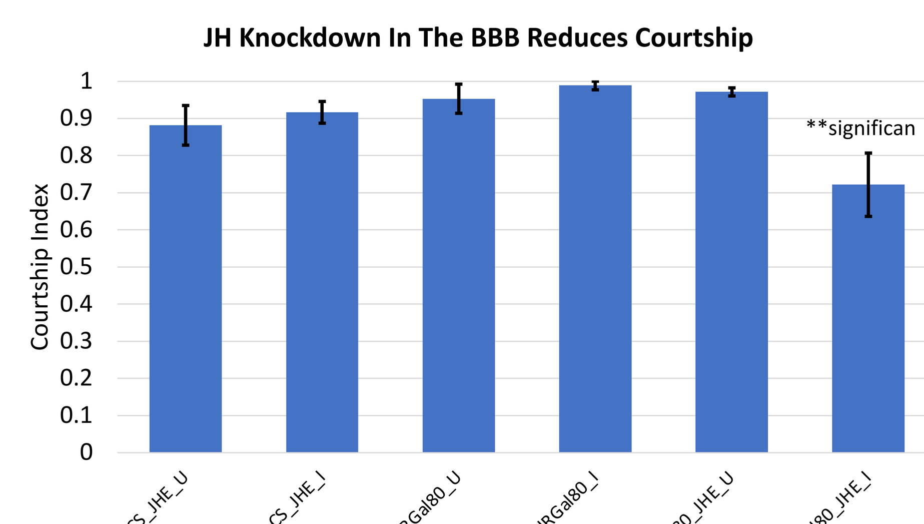

Fig. 5 Courtship Index +/- SEM

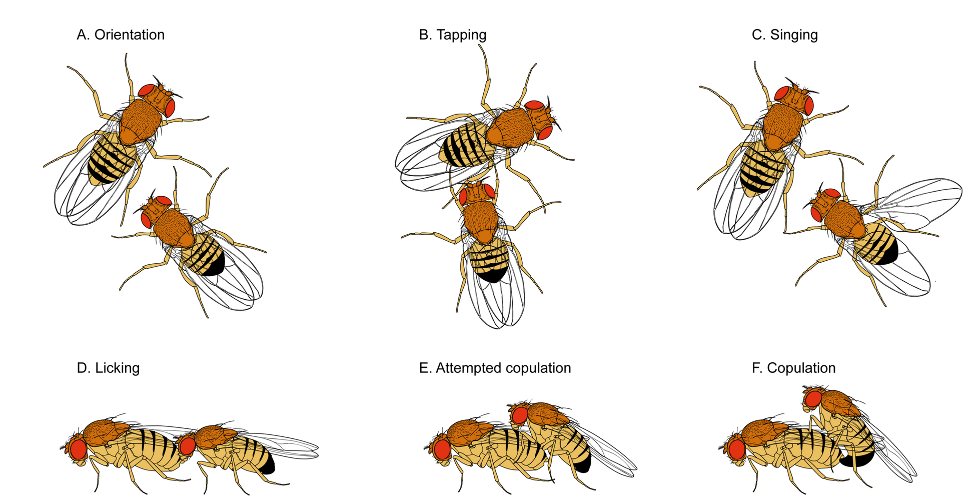

Fig. 3 Six Courtship Behaviors of *D. melanogaster*

Fig. 4 Courtship was observed in small chambers

The results support our hypothesis, showing a lower courtship index in flies with reduced JH hormone in the BBB. The BBB is visually shown in Fig. 2 along with the Nuclei around the brain. The six different courtship behaviors orientation, tapping, singing, licking, attempted copulation, and copulation as illustrated in Fig. 3. The fly chambers where courtship behavior was observed were circular compartments to stimulate ideal environments for courtship behavior as can be seen in Fig. 4. The graph in Fig. 5 shows a reduced courtship index for experimental induced flies compared to uninduced experimental & control flies.

Methodology

- Our hypothesis was that the JH hormone is required in BBB for courtship; hence, when knocked down, this will lower courtship. To test our hypothesis, JH hormone was reduced in the BBB of adult male flies to examine courtship.
- *Drosophilia melanogaster* mating videos were observed for courtship behavior consisting of orientation, tapping, singing, licking, attempted copulation, and copulation.
- The courtship index was calculated as follows: (#min*60+#sec)/600
- N=3 (18 videos) were observed.
- Average courtship index was calculated and graphed.

Conclusions

Our results show that there is a lower courtship index for flies with reduced JH levels in the BBB; hence, we can conclude that JH plays a part in courtship behavior. The study of the processes in the BBB could help understand numerous diseases such as Alzheimer's where our data might help in analyzing the contribution of BBB defects.

Acknowledgements

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References

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