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Deciphering the role of the octopamine receptor $OA\beta 1R$ in *Drosophila* male aggression

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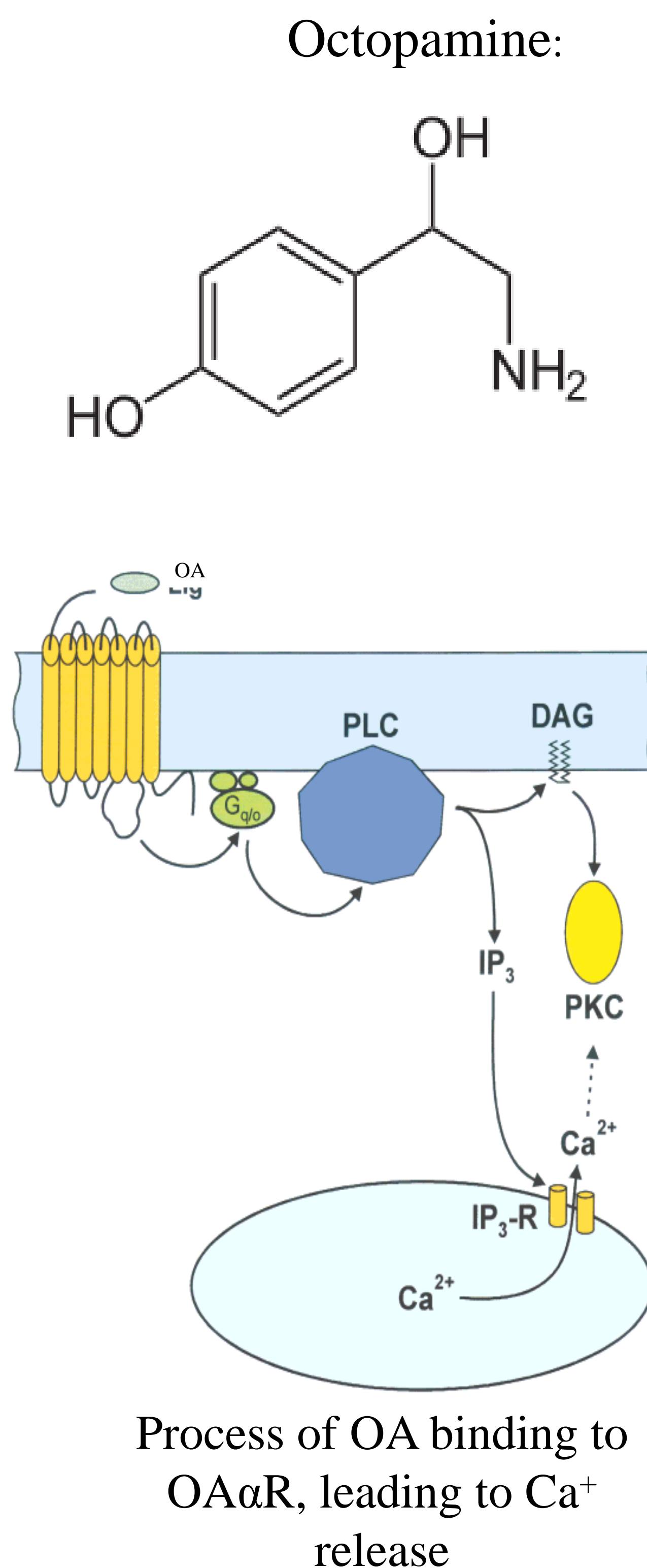
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Background

Aggression and courtship are two key behaviors thought to contribute to an organism's ability to survive and reproduce. While aggression is important in securing territory and resources, courtship is important for signaling receptivity and discriminating between conspecifics and other species.

Octopamine (the invertebrate analog to human norepinephrine) has been identified as a key player in the generation of courtship and aggressive behavior in *Drosophila melanogaster*. To identify potential neurons which may form an important part of the network responsible for the attenuation of *Drosophila* behavior, we chose to investigate the contribution of Octopamine $\beta 1$ Adrenergic-like receptor ($OA\beta 1R$) expressing neurons to the generation of aggression and courtship.

Therefore, it is the goal of this research to identify the contribution of $OA\beta 1R$ neurons to courtship or aggressive behavior.



Methods

Procedure

- Socially naive male flies are isolated in the pupal stage and painted after eclosure.
- Two flies of the same genotype are placed in a 35 mm x 35 mm x 25 mm fight chamber containing a small food cup with a drop of yeast paste in the center.
- The environment is controlled with a temperature of 23-25°C and high humidity ($\geq 40\%$).
- Fights are recorded via digital camcorder for later analysis.

Courtship Scoring Criteria

- Percentage of trials with courtship
- Latency to first encounter
- Number of courtship events
- Duration of courtship events
- Prevalence of Male-Male courtship

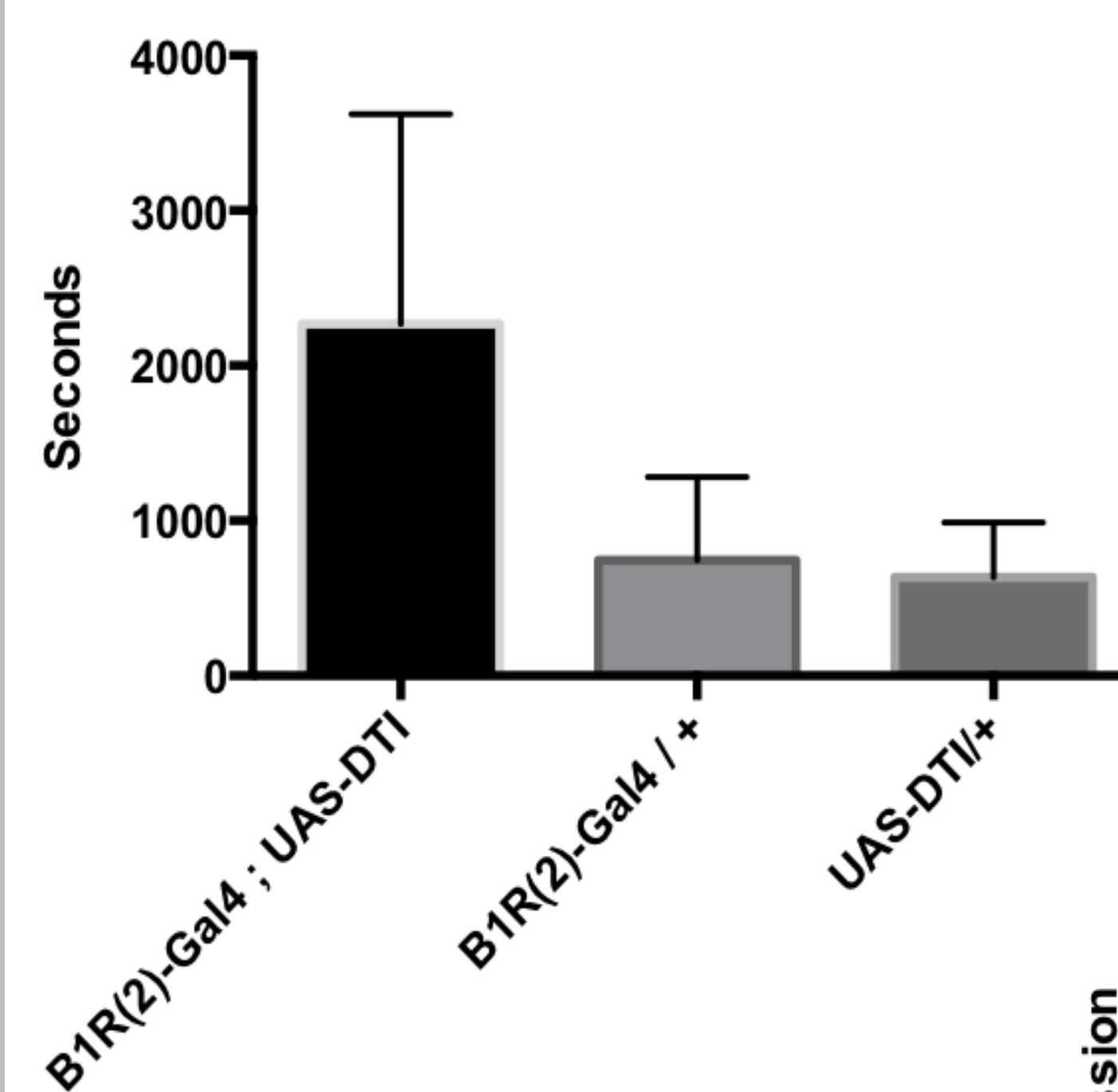
Aggression Scoring Criteria

- Percentage of trials with lunges
- Latency to first encounter
- Number of lunges
- Establishment of a hierarchical relationship
- Various other aggressive behaviors (wing threats, wing flicks, sparring, etc...)



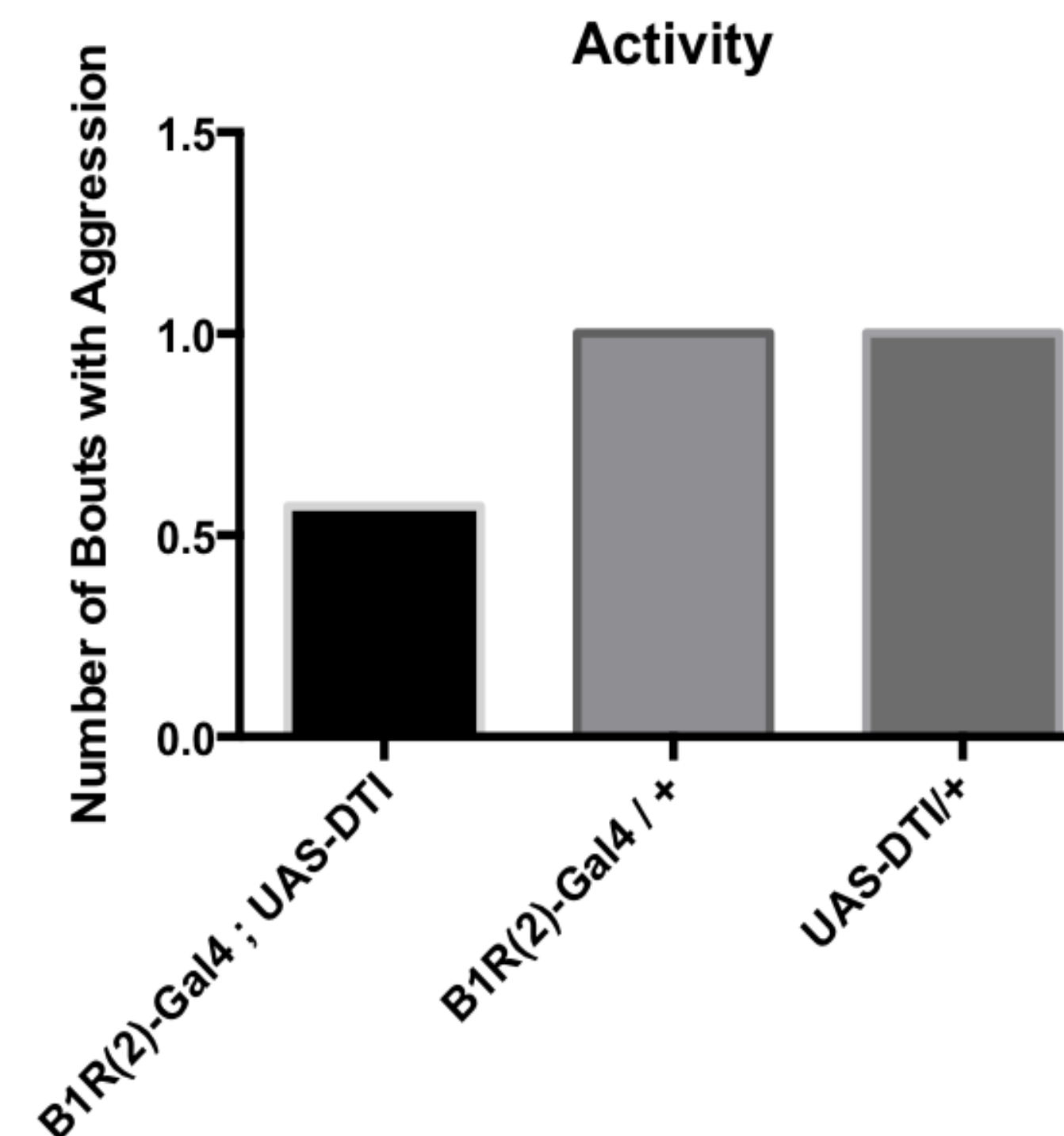
Aggression

A Latency



(A) Flies lacking $OA\beta 1R$ neurons show a noteworthy but non-significant increase in latency.

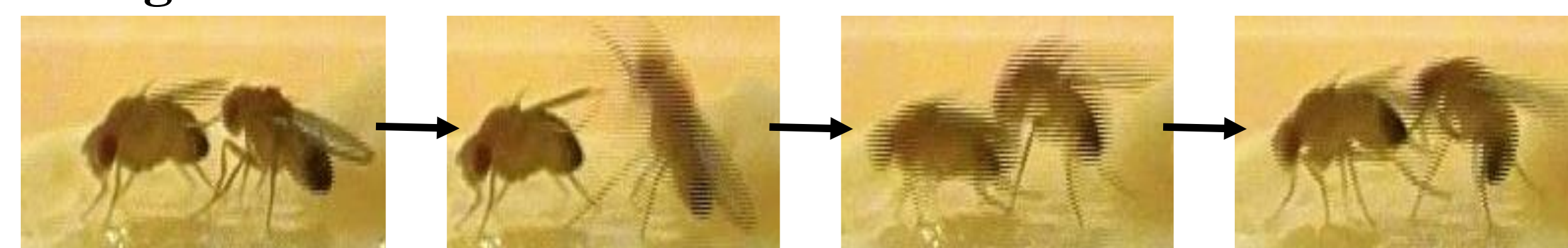
B Activity



(B) Only 50% of experimental flies demonstrated aggression within our paradigm, while control flies exhibited aggressive bouts during all trials.

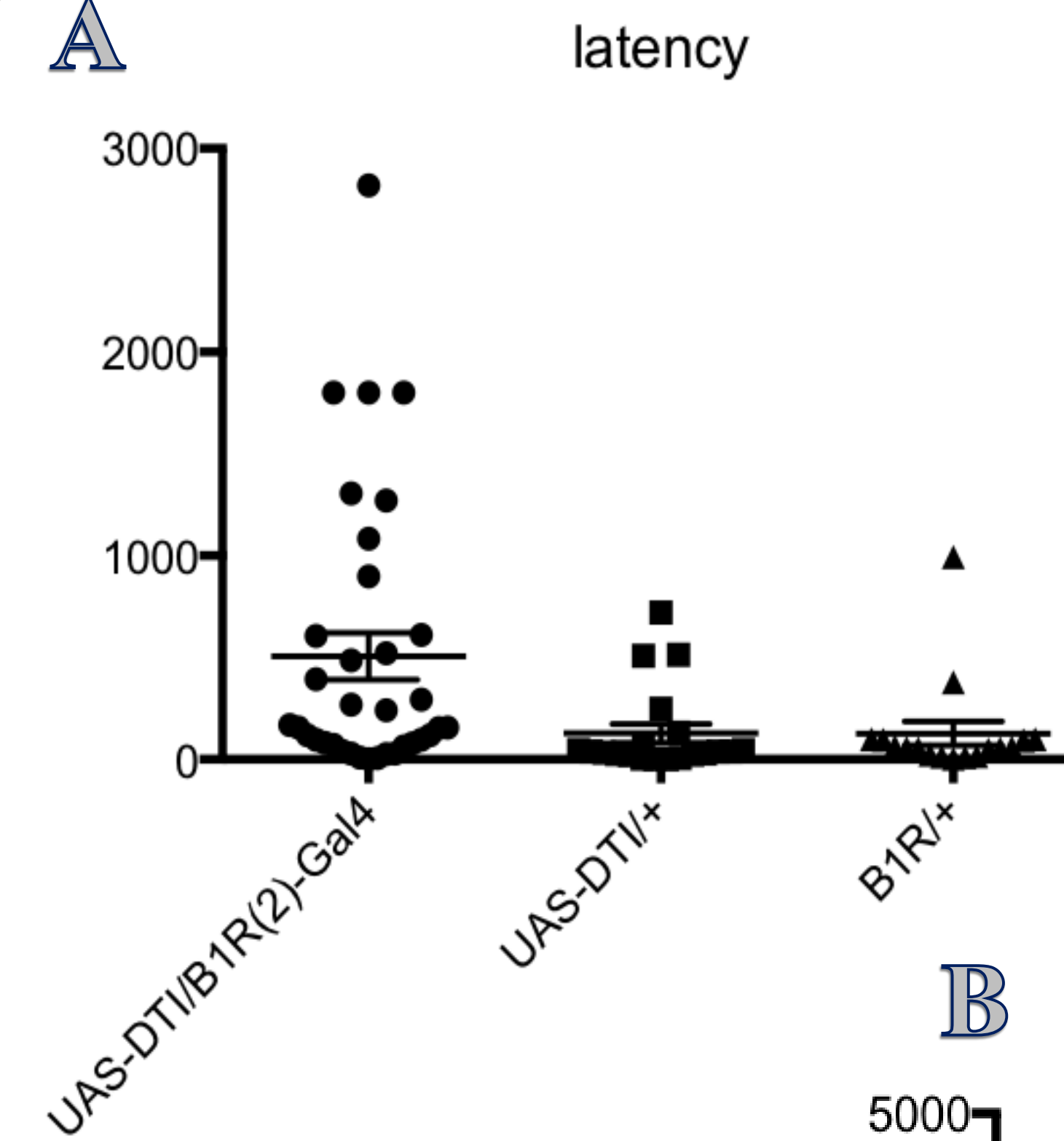
Drosophila aggression:

A lunge



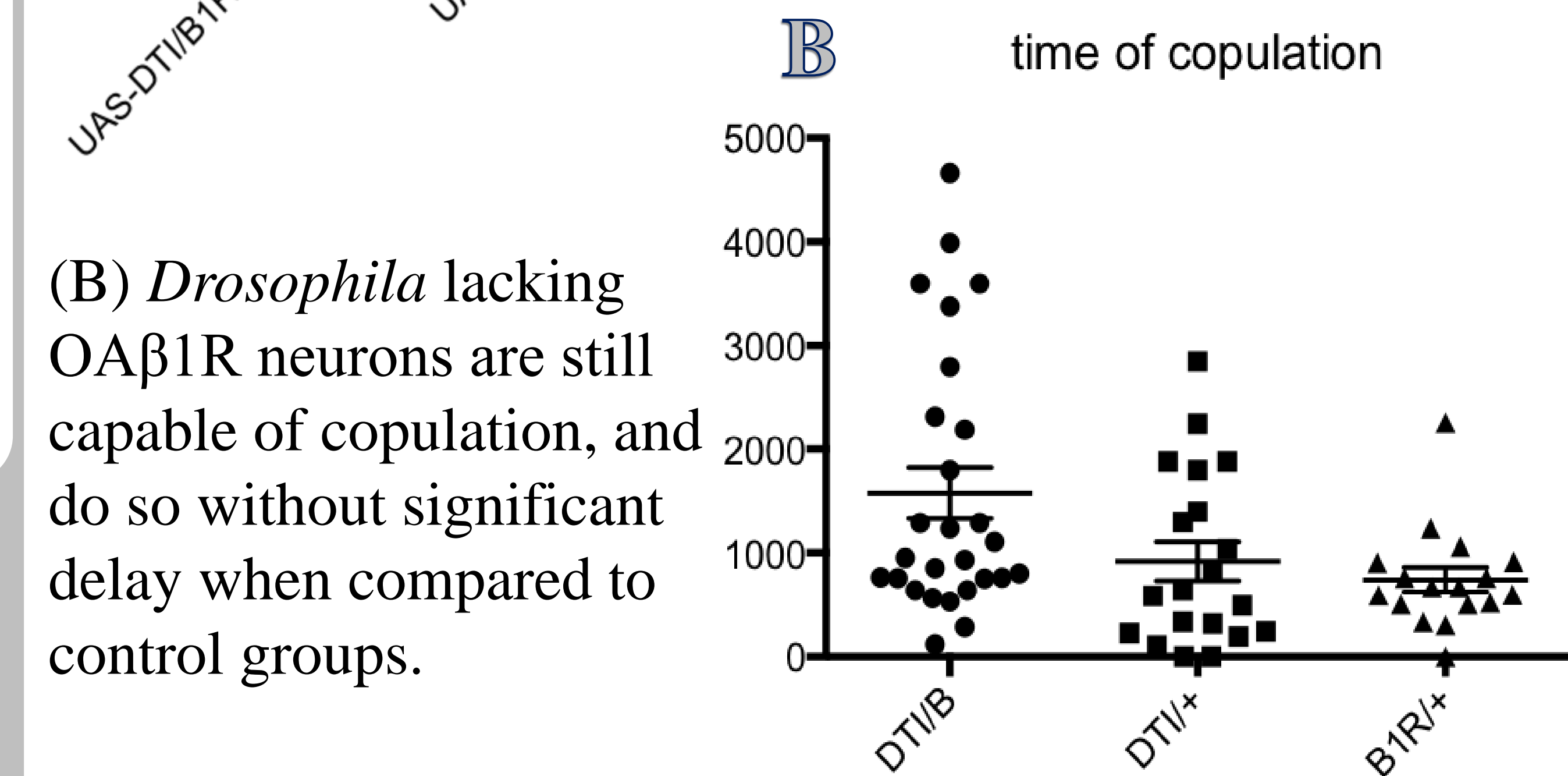
Courtship

A



(A) *Drosophila* lacking $OA\beta 1R$ neurons demonstrate a significant increase in latency in the initiation of courtship when compared to control groups.

B

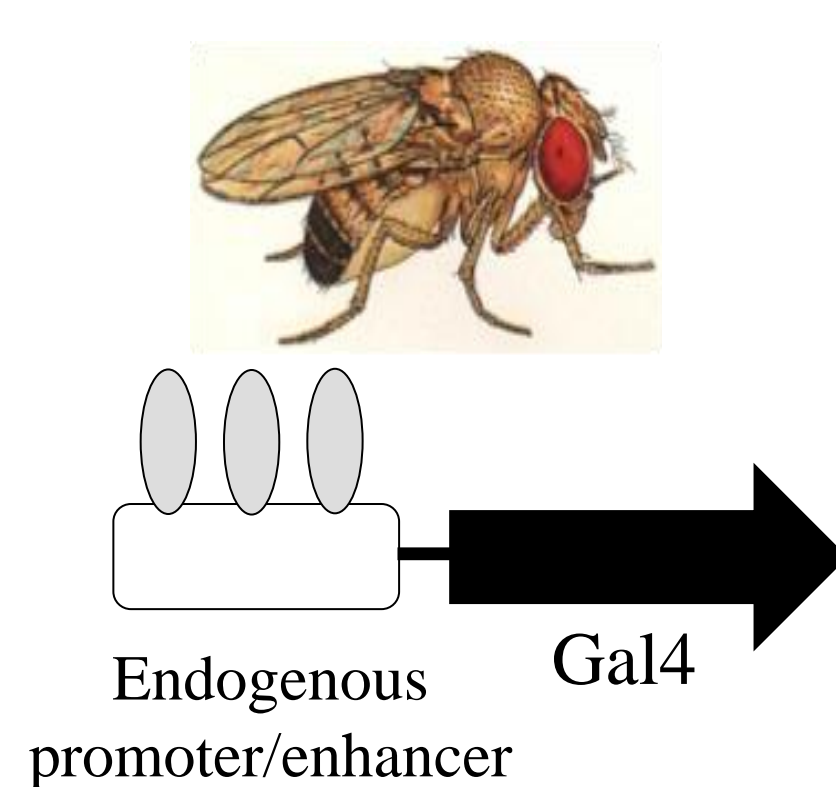


(B) *Drosophila* lacking $OA\beta 1R$ neurons are still capable of copulation, and do so without significant delay when compared to control groups.

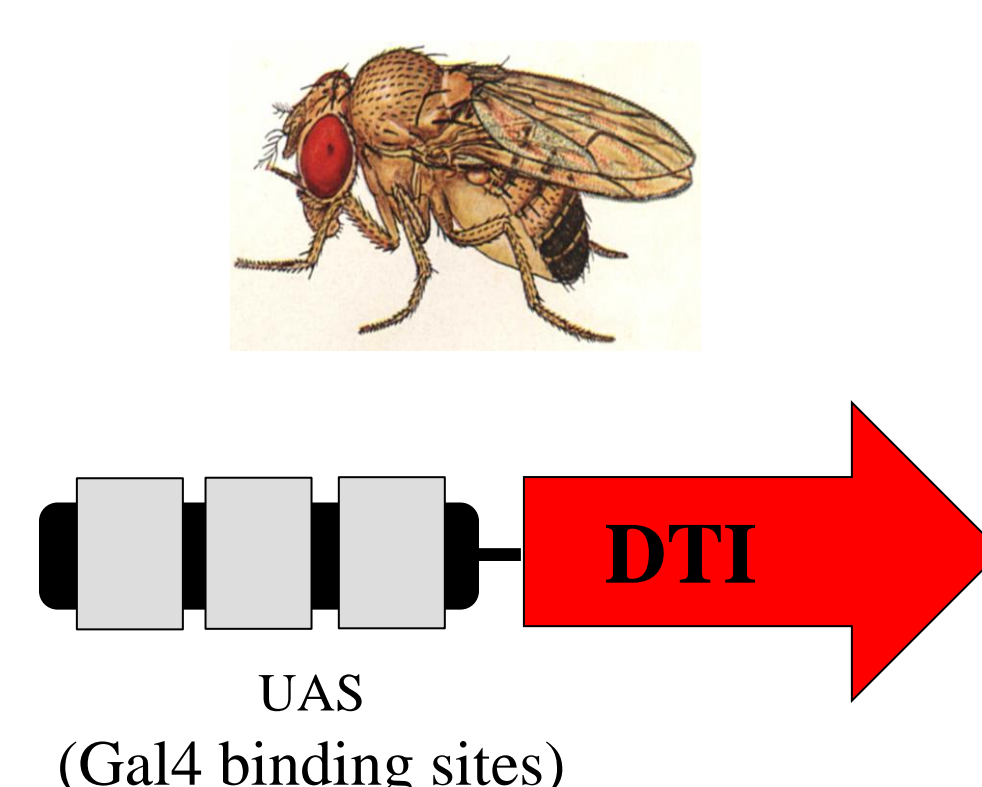
Genetic Tools

Gal4/UAS System

Gal4 expressing line



UAS-target gene line



Acknowledgements:

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Conclusions

Thus far, we infer:

- $OA\beta 1R$ neurons may contribute to an increased latency in courtship and aggressive behavior.
- Ablation of $OA\beta 1R$ neurons may result in a decrease in overall activity levels.
- The rate of copulation is unaffected, and nor is fertility impacted.
- $OA\beta 1R$ neurons do not appear to affect the intensity of aggression, once aggression has been initiated.

Future Directions:

- Further assess levels of activity and identify any potential motor deficits.
- Increase the number of aggression assays performed.